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ELECTRICAL REVIEW

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ELECTRICAL REVIEW

Volume CXXX — No. 3351

Friday, February 13, 1942

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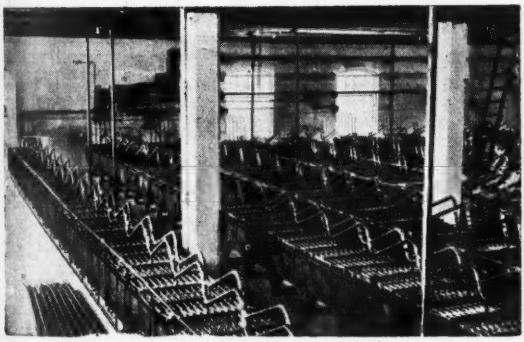

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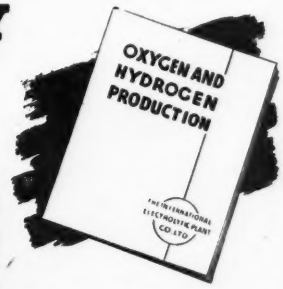

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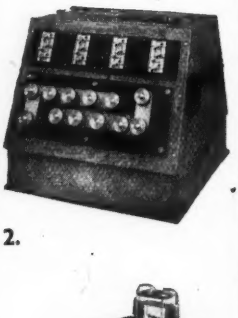

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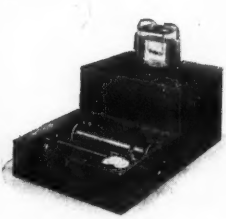

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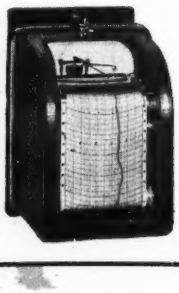

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXX. No. 3351. FEBRUARY 13, 1942 6d. WEEKLY

Public Service

Responsibilities of Professional Men

SOMETIMES professionalism is spoken of as a good thing, sometimes as a bad. Which is correct depends upon the outlook of professional men. If their aim is to use the privileges accorded to special knowledge in order the better to fulfil their corresponding obligations to the community, it is more than legitimate, it is even desirable, that they should seek to maintain a status appropriate to their responsibilities. By doing so they attract the best men to their ranks and eliminate the public menace of the charlatan.

Organised Action

Taking a long view, they may reasonably claim that the performance of certain duties should be confined to technical men so that these may gain the requisite experience. It is also arguable that practitioners ought to be members of a representative body, not because this necessarily implies aptitude for particular tasks, but because non-participation may tend, negatively, to be an obstacle to beneficial efforts that can become effective only through organised co-operative action. Or it may be held that free-lances are more likely than those bound by a professional code to set their own gain above the common weal.

How far they should go in pressing their claims in these directions is a question of a professional conscience that has been conditioned by the maxim "Give all thou canst; high Heaven rejects the lore of nicely calculated less or more." That is the price of achieving a true professional status, though it clearly does not rule out the right to require adequate material remuneration for the hard training needed to attain it.

One misconception has especially to be avoided. That is the view that professional activities exist primarily to advance the prestige of the craft they represent or to give scope for the exercise of skill for its own sake. They will do so, of course, but only indirectly. Their purpose is public service; this is more obvious where, as in electricity supply, technicians are in close association with the ultimate users of their products.

Ascertaining Public Needs

Failure to realise this fundamental principle—a failure that has been exemplified from time to time in our Correspondence Section—would disqualify an engineer from holding the highest administrative positions. Possibly some confusion has been caused by the misuse of the term "commercial" merely to indicate an absence of technical qualification (as though ignorance could ever be a qualification for anything) whereas, in its socially useful sense, it means something quite positive, *viz.*, a knowledge of how to ascertain the needs of the public and to co-ordinate experience of all the ins and outs of the industry to decide how such needs can be met in the most economical and practical manner.

On these grounds engineers have a good start of others as candidates for managerial

responsibilities. They have not, of course, by any means a monopoly of the requisite organising ability, and others not so fortunately circumstanced, yet possessing an outstanding flair for administration, have successfully overcome the initial handicap of a lack of engineering background. In short, the pragmatic test, that what works best is right, applies. This means that only through giving understanding service, directly or indirectly, to the public will professionalism either be justified or hold its own.

Lighting Standards

WHILE the necessity for much improved lighting is too evident in many factories, the drive to raise the standard comes at a time when there is a pressing need for the conservation of labour and material. As a result of this it is desirable, when the Regulations have been complied with, to concentrate attention upon the most glaring (if that is the right word) examples of inadequate illumination, leaving the rest to be brought up to standard as and when means permit. There are at least three questions which factory managements and lighting designers should study when deciding what should be done immediately. First, will production be increased; secondly, do workers complain of the existing lighting; and, thirdly, is the present lighting giving rise to serious glare or troublesome shadows? Affirmative answers to any or all of these provide sufficient justification for action.

Bombed Transmission Lines

CONTINUING our series of articles on the effects of bomb explosions upon electricity supply systems, in this issue we make a brief study of what has happened to overhead lines in a number of actual instances. The outstanding point is that it has to be a particularly unlucky hit that puts the service out of action for any length of time. Most of the lines are outside urban areas and generally speaking do not present much of a target for high-flying aircraft. Wood poles appear to withstand blast better than steel ones, but the latter will put up with a good deal before giving way. An occasional minor annoyance is the operation of the protective gear by lines whipping together as a result of blast, but this may be looked upon as a useful test of the efficacy of the equipment. In subsequent issues we propose to deal further with effects in urban areas and methods of repairing damaged gear and restoring supply.

Distribution Regulations

A COMBINATION of the Safety and Overhead Line Regulations of the Electricity Commissioners, elaborated in the manner of the I.E.E. Regulations, roughly describes the Rules for the Installation and Maintenance of Electric Supply and Communication Lines, a new edition of which has been compiled for the United States Bureau of Standards. Both similarities and contrasts with British methods are instructive. A discussion of the Rules is to be published later, criticisms and suggestions from those with practical experience in their application being invited in the meantime. The setting up of a committee to deal with requests for interpretations should also do much to assist in attaining a high level.

Cheap Street Lighting

THE following may be regarded at the moment as interesting but irrelevant; it is, however, one of those things which may come in useful after the war. In ten years Detroit (the automobile metropolis) has increased the number of lamps used for street lighting from 28,000 with an average output of 4,300 lumens to 40,000 with an average output of about 7,000 lumens, and yet the cost per head to the people of Detroit has only risen from $0.91 to $1.02, a figure which covers all operation, maintenance, depreciation and capital charges. The cost of the improvement has more than paid for itself in the reduction of the number of street accidents.

Prevention Better

MAINTENANCE of high-voltage apparatus is very largely a matter of detecting insulation weakness in its earliest stages by regular testing on the spot, usually while the apparatus is alive. This requires robust equipment such as that described in our issue of July 25th by Mr. J. S. Forrest, who with Messrs. E. A. Burton and T. R. Warren presented a paper on "Field Measurements of Insulation" before the Meter and Instrument and the Transmission Sections of the I.E.E. last Friday. The fruits of their experience on the C.E.B. system should be invaluable, not only to supply engineers, but also to manufacturers, to whom the fullest scope can be given only if their laboratory work is supplemented by tests in service.

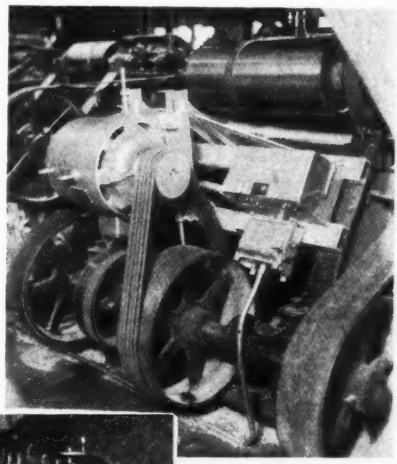
Leather Production

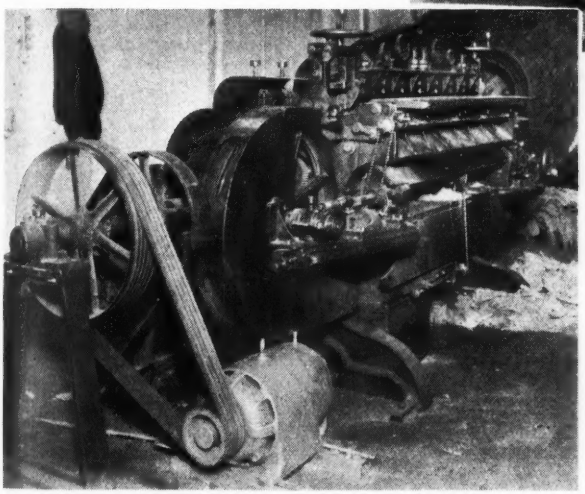
A Recently Converted Factory

EXCELLENT operation and other improvements have resulted from the conversion from oil-engine to electric driving of the factory of the Odell Leather Co., Ltd., according to Mr. H. A. Thorne, managing director, and members of his staff. The original scheme embraced two prime movers, a 96-HP Ruston & Hornsby single-cylinder horizontal oil engine, which drove most of the machines through a main shaft, and a 76-HP four-cylinder vertical unit of the same make coupled to a DC generator for supplying the motors of a few of the machines which were already electrified. A small generator driven by the larger machine supplied the factory lighting.

In consequence of serious overloading the time had come when further capital outlay was required to maintain the mechanical driving system, and as so often happens in such cases the answer to the problem was found in public supply. With the change-over the factory has been extended a little and there is now a total of about 270 HP of motors installed, mostly small units.

With a few notable exceptions individual driving has been adopted throughout the installation and there are some excellent examples of how difficult space problems have been overcome by ingenious schemes for fixing the motors and transmission gear to various parts of the machines and of the building. Before dealing with the factory processes, however, we must emphasise that it is not possible to refer to them strictly in order for all classes of leather because the operation sequence varies between one type of material and another.





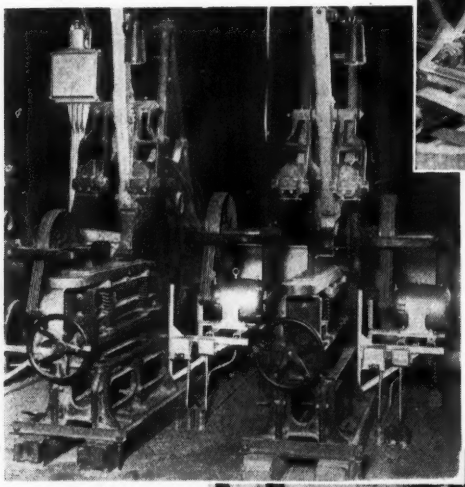
From a 7½-HP motor bracketed on each shaving machine there is a three-to-one transmission. Left: Each splitting machine has a speed of 500 RPM at the original machine pulley

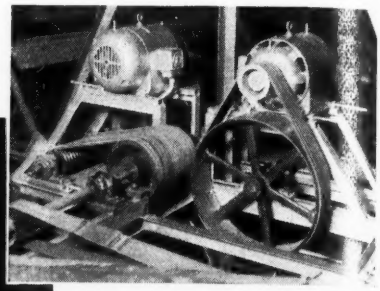
In the following notes, however, we have attempted to "strike an average."

The factory raw material is partly treated hide, or, shall we say, partly prepared leather, which is received in bales and, after unpacking, first softened by soaking in large water vats. The material is then split to the required thickness on machines which each have a band knife travelling longitudinally between two rollers through which the leather is passed. Each of these machines is driven by a 7½-HP 1,500-RPM motor which is mounted on the floor and

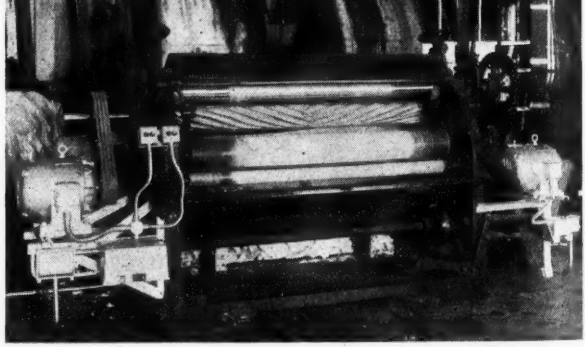
has a short multi-vee belt which transmits about 500 RPM to the original machine pulley.

The split leathers are then passed to shavers in which the surface of the material is made smooth and the thickness rendered uniform by means of radial fin knives on a cylinder which travels at a high speed over the surface of the leather. From a 7½-HP, 1,500-RPM motor bracketed on the back of a double-width shaving machine there is a three-to-one reduction transmission to the machine shaft from which there are two flat-belt drives up to the knife cylinder shaft. The machine also embodies a grinding stone, which is belt driven from a cylinder along the surface of which the belt is carried to and fro as the stone is moved over the knife edges by a worm drive. Such a machine will take leather up to 3ft. 6in. wide, while a single-width machine, which is served by a 5-HP motor and has similar transmission arrangements, will handle skins up to about 2 ft. wide.

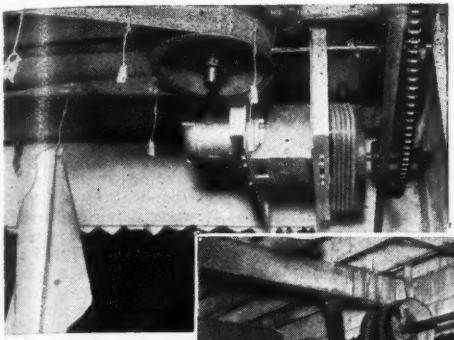




The drying room fans involve some intricate drives. Left: The reciprocating motion of the glazing arms is imparted by an eccentric. Below: There are separate drives for the cylinder and out-rollers on this setting machine



The next process is tanning, and here we come to one of the exceptions to the individual driving principle adopted for the factory. The tanning is effected in large drums about 10 ft. in diameter, which revolve vertically about a horizontal axis for several hours with the leathers and the tanning and dyeing materials inside. Six of these drums in one corner of the factory left little room for housing individual motors and transmission gear without unjustifiable expenditure, so a group drive was the solution in which was also found the answer to a ventilation problem in a drying room above the drums where the 35-HP motor for the drum driving is installed. The motor is mounted on the floor through which vee-belt transmission is taken with about a 4.6 to 1 reduction ratio to the group-drive belt shaft bolted to the ceiling immediately



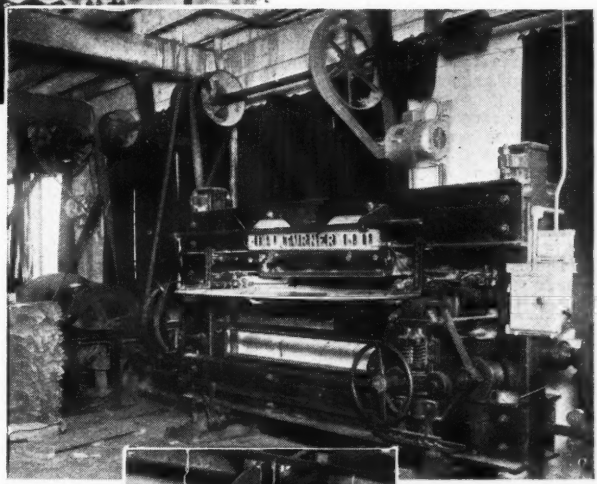
The skins are dried on a very long belt requiring little power but great reduction. Right: Two steam-heated ironers have a 7½-HP group drive

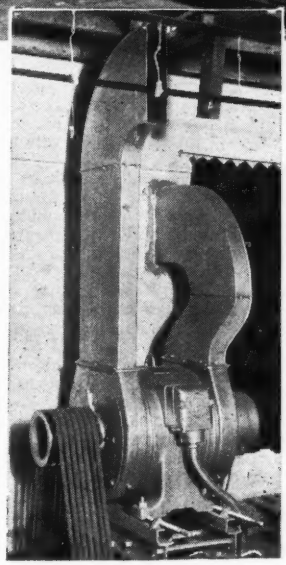
below. There are one-to-one individual-transmissions from the shaft to the pulleys on the drum spindles.

A few machines are similar to the tanning drums in construction but they have different missions and are individually driven. A stuffing drum, for instance, which is used to work grease into certain kinds of leather, is served by a 7½-HP, 1,000-RPM motor, while two dry drums in which the leather is knocked about for "samming" and softening, each have a 5-HP, 1,000-RPM motor. In all these and similar cases the motor is suspended from the ceiling and transmits with a four-to-one ratio reduction to a short countershaft which is also suspended from the roof and from which there is a two-to-one transmission by flat belt to the machine.

Wet skins from the drums are partially dried either in centrifuges or hydraulic presses. An 8-ft. diameter floor-mounted centrifuge will accommodate about 100 skins and it revolves at about 1,000 RPM. Direct from the vertical spindle under the container there is a one-to-one ratio transmission to a shaft pulley near the roof via a couple of jockey pulleys giving a right-angle transmission at the floor level. A short vee-belt transmission from the roof-suspended motor has a five-to-one reduction ratio to the countershaft. The pump for the hydraulic press is driven from the group-drive shaft for the five tanning drums referred to.

Setting, the next process, is a mangling operation which stretches out the skins and removes the effects of shrinkage from the water processes. The skin is passed through rollers





The tanning drum group drive in the drying room

when it is pressed against blunt blades which are otherwise like the blades on the shavers. The latest example of the setting machines has a 7½-HP drive, while the transmission is unusual in that it is from vee-pulley to vee-pulley, and not vee to flat, on account of the very small ratio, namely 1½ to 1, giving the machine a speed of 1,000 RPM. Some of the older setting-up machines, however, are each served by two motors, one driving the knife

cylinder and the other the outer rollers. The set-out skins are then treated in a drying room where, stretched out on perforated metal sheets, they are suspended over steam pipes and underneath 10 ft. diameter fans. These fans create a down-draught, and the general idea is to maintain a circulation of dry air throughout the room, rather than to pass heated air over the skins. An angle-iron frame carries the two 7½-HP, 1,000-RPM motors near the centre point of the line of sixteen fans driven from two shafts running in opposite directions from the motors. There is in each case a very short transmission with a very wide ratio, namely, seven-to-one to a countershaft, and then a two-to-one secondary reduction by as many as sixteen vee-belts on to the shaft.

Following trimming, a hand operation in which the rough edges are cut off, the skins are sprayed by compressed-air equipment served by a motor-driven compressor. Tabling is another operation in which colour is applied by hand brush, and after this, or spraying, the skins are dried on a very long, slow-moving belt which requires very little power but an enormous transmission reduction ratio. The 1-HP geared motor unit first transmits to a countershaft from which there are series chain transmissions in three steps to pulleys actually in the belt conveyor system, but each conveyor pulley has a side rack round its periphery which constitutes part of a right-angle pinion transmission between the chain and the conveyor pulley.

This is the drying room in which is installed the 35-HP motor for the tanning drums referred to earlier in the article. The room is heated for drying purposes, so that the pipe-ventilation system adopted overcomes difficulties with the motor on that score. Good air circulation is also vital in this room and it is considerably assisted by arranging the outlet of the motor pipe-ventilation scheme in the room itself.

Buffing and Glazing

Buffing is a subsequent process which involves passing the dried leather, as we now term the material, through abrasive rolls. Each double-width buffer is driven by a 5-HP, 1,000-RPM motor *via* a 2½-to-1 ratio vee-to-vee transmission, and four of these machines are directly connected to a dust-extraction system served by a 7½-HP motor. Glazing is a process which involves stroking the surface of the leather by a member with a highly polished surface, glass, for instance, the member being held by a reciprocating arm. On a small angle-iron structure at the side of the machine is the 2-HP motor which transmits with a six-to-one ratio reduction to the machine shaft from which the reciprocating motion is imparted by an eccentric.

Staking is a softening operation in which jaws close over the leather and, by a reciprocating motion, draw over it in a tortuous path the rollers and the edges of blunt blades attached to the jaws. Three of these machines form a group drive from a 12½-HP wall-mounted motor with a first transmission at 4½-to-1 reduction to the shaft (250 RPM), and a second transmission by a three-to-one flat-belt reduction to the machines. The leather is next subjected to an ironing operation for which a roller travels to and fro on a worm and pushes the leather up against a heated chest. Two steam-heated machines are driven by a 7½-HP motor because of existing transmission arrangements, while an all-electric ironer has a 5-HP incorporated drive with worm transmission and an automatic solenoid band brake as well as a thermostatically controlled 6-kW heating plate.

Low-Power Rolling

Boarding, another softening and graining process, involves passing the leather through very heavy rolls about 8½ ft. long and 2 ft. in diameter. But only 2-HP is required and the transmission is first to a countershaft with a three-to-one reduction from 1,000 RPM, and then through chain gearing by which opposing directions of rotation are given to the rollers, so that the leather is drawn round the edge of a blade situated between the rollers.

In a separate installation for stamping out the soles of shoes, a number of presses operate with specially shaped knives and constitute a variety of group drives. For instance, 10-HP, 7½-HP and 5-HP motors group drive, respectively, five, three and one presses.

All the motors in the factory up to 7½ HP are squirrel cage and the larger ones are of the slip-ring type. Except for the geared motors, which are B.T.H. machines, the driving units are mostly English Electric and Brook motors, and they are all totally enclosed fan-cooled equipments. In most cases the motors are served by " Memauto " contactor starters with push-button control.

Generally the lighting throughout the factory is by 200-W Revo industrial reflectors, but in the sorting department fluorescent lighting is employed as an aid in colour matching. A public electricity supply is received at 11 kV from the Rushden and District Electric Supply Co., Ltd., and transformed on site to 400/230 V for power and lighting distribution, which are effected by a very neatly laid out distribution board built up with M.E.M. switch-fuses, J. & P. main breakers and enclosed busbar chambers on an angle-iron frame. A main power factor correction scheme employs a 54-kVA B.I. condenser.

The complete installation electrical scheme, including all drives, was designed by Mr. W. C. Timpson (Central Electric Co.), and to him and Mr. W. S. Ekins of this company we are indebted for help in the preparation of this article. Our thanks are also due to the Odell Leather Co., Ltd., and to Mr. Thorne, who kindly explained the manufacturing processes.

Wartime Wiring

Simplification, Substitution—and Satisfaction

By T. C. Gilbert, A.M.I.E.E.

THE reports of the discussion opened a short time ago by Mr. A. G. Ramsey at the Institution of Electrical Engineers convey an atmosphere of unreality. The reader looks again at the names of the several contributors to the discussion to ascertain if they are in any way connected with, or have any interest in, the installation side of the industry. Nothing concrete emerges from the pooled wisdom of the assembled company, and beyond the advancement of the twenty-year-old doctrine of single-pole fusing there is little that can be said to further the author's admirable intention in any marked degree.

It may be that the industry is as yet unprepared for any major revision of installation methods; it was never receptive to sudden advancement of new ideas, but needed time to think them over. Possibly, therefore, a second meeting on the same lines might be productive of some really helpful ideas, when we may have got our second wind and given birth to second thoughts. It was, perhaps, not quite fair to ask us to modify our methods of thirty years at such short notice; naturally pet ideas which had long been in cold storage had to be brought out for an airing and possibly advanced as the great secret which would provide us with cheap and excellent installations in this day of need. I feel that the industry can do much better.

It is thought that the substitution of non-metallic for steel tubes and the simplification of insulated wires would effect great economy in material and expense

A great deal of aimless discussion appeared to range round wiring systems; our mainstay, steel tubes, being no longer available, we talked about cleat systems and the orthodox surface wiring systems. Not one original idea emerged in this direction, from which the onlooker is entitled to deduce that there are no other wiring systems possible and that we can only ring the changes between them. The answer is that surface systems do not meet the present requirements, being too extravagant of material, whilst needing much too high a standard of technical skill for their safe erection—as regards lead-covered systems at least.

Easy Installation

A cleat system is apparently simple, but it is beyond the capabilities of the tyro, whereas, if I read Mr. Ramsey's intention aright, he is seeking a wiring system that can be very easily put in—by women if necessary—and which will utilise a minimum of scarce metals and other materials and yet be capable of being brought up to some higher standard when peace returns. Cannot the industry offer this? Of course it can.

Tube systems have enjoyed great popularity in this country for many years, chiefly because of outstanding advantages possessed by no other methods. Steel tubes are very quickly erected without entailing great skill and can be concealed under plaster. The wiring is safely out of the way until the heavier work on the building has been completed. The drawing-in of cables is not often very heavy work and does not call for a high technical training, whilst modern accessories practically erect themselves. Many years of service may be expected from such systems, and they lend themselves to fairly easy modification or extension. There is, however, one unfortunate snag—the necessity for the perfect bonding and earthing of tubes, when of metal, and this is now generally acknowledged to be difficult.

The answer seems plain; as tubes have established ascendancy over surface systems or concealed surface systems, considerations of utility demand that we stick to our tubes. As steel is no longer available we must make them of something else, preferably of non-metallic substances, which will eliminate the continuity bogey and cut out half the skill necessary for erection. This simple step will necessitate no change in technique, no revision of rules—nothing, except a simplification of our problems.

Simpler Cables

Having produced our non-metallic tube—substitution—we can then effect economies in cable—simplification. The first thing would be to take away the valuable cotton coat, leaving the conductor clad only in rubber and tape; as the insulation would be under no stress of voltage to earth, even the rubber vest might be thinned down a bit, for at the end of the war this low-grade cable can be replaced by a standard type. So far we seem to have effected a few economies without any disturbance to our ideas regarding the fitness of things, or, most abominable of all, introducing any new-fangled ideas.

Even so, we can go further, but this must be whispered very quietly as it is a thing just not done in the best installation circles—we

C*

can use 1/.044 instead of 3/.029. By this simple means we obtain a cable of equal nominal current-carrying capacity with the expenditure of less copper, rubber and cotton—surely just what we are looking for. Possibly for the duration we could come down to 1/.036 without losing more than a few volts, and the saving in precious metal and rubber would be more marked; we can no longer afford such extravagances as stranded cables, at least in the smaller sizes. The domestic installation will demand nothing heavier than 1/.064, of blessed memory, which, although enjoying the benediction of B.S.S. No. 7, appears no longer in the manufacturers' lists.

I am suggesting, therefore, that the solution of the problem on the wiring side entails nothing more than the replacement of steel tubes by non-metallic tubes, followed by modifications in cables—made simple by the non-conductive nature of the tubes. If earthing is necessary to any point, another conductor can always be drawn in with the circuit wires, although possibly the greatest economy of all would be the total suspension of earthing for the duration. Its efficacy is doubtful at the best of times, and in these days the slight added hazard would be cheerfully undertaken; personally, I should feel safer without present-day earthing, which is often perfunctory and unsound.

Certainly concentration on these points would pay dividends in excess of those afforded by single-pole fusing, which at best merely eliminates one-half of the fuseboard and one fuse on the main switch-fuse—we still require a double-pole switch. In the average domestic installation I do not visualise more than a 15s. saving with single-pole fusing, which entails the production of non-standard equipment.

Million-Volt X-Ray Units

Some American Examples

By P. Morris

A NUMBER of American firms are employing million-volt X-ray equipment produced by the General Electric Co. of Schenectady, and recently representatives of some of them met at Schenectady to compare experiences.

Applications and possibilities were discussed jointly by Dr. E. E. Charlton and W. F. Westendorf (of the G.E. research laboratory) in their papers at the symposium. In contrast with special 800,000-V medical equipment built a few years ago, which required a special multi-story building, the million-volt design for industrial use is less than 5 ft. high, 3 ft. in diameter, and weighs about 1,500 lb.; this is made possible by the use of freon gas under pressure as an insulating medium in place of oil, a resonance transformer without an iron core, and a multi-section X-ray tube inserted in the centre of the high-voltage coil. The power required to operate the machine is approximately 4 kW and, moreover, it is portable within the limits of a room constructed to prevent the escape of stray radiations, while it can be mounted so as to take radiographs at any angle and inserted horizontally within a pressure vessel, thus minimising the number of exposures and consequently the time involved.

America's defence programme has given a considerable impetus to the employment of X-ray examination in industrial works. Developments were discussed at a recent conference

It is said that five-inch steel plate can be radiographed in about five minutes at a focal distance of 48 in., whereas with 400,000 V two-and-a-half hours were required at a focal distance of 32 in. A 3-in. plate requires two-and-a-half minutes with 400,000 V and only 48 sec. with a million volts.

The Ford Motor Company, in tests conducted on a heavy part destined for a large bomber aircraft, found that a minimum of six exposures per casting were required with 400,000 V, but that the million-volt machine is capable of X-raying the entire castings at one exposure. The superiority is attributed in large measure to the reduction of backscatter and to the greater distance from X-ray source to film.

In the laboratory at Schenectady the million-volt machine is housed in a room with walls which consist of 14 in. of concrete and 12 in. of brick, extending 5 ft. underground, and the 1-in. steel door leading into the office is protected by an 18-in. concrete baffle. The trailer entrance door is of 2-in. steel plate with 18 in. of concrete. There is also a trap door in the roof for admission of large castings handled by an outside crane.

The Babcock & Wilcox Co. has a million-volt X-ray outfit at its Barberton plant in a concrete pit at one end of the welding shop. It claims that if it were possible to obtain 100 grammes (about 3.2 ounces) of radium, radiographs might be made with gamma rays as quickly as with the million-volt X-ray tube, but the contrast of the resulting films, except in the thickest specimens of metal, would not be so good as with X-rays. A further advantage is that it is no longer necessary to

overreach the penetration ranges of the lower-voltage equipment, and each voltage may be applied to a particular thickness range with certain radiographic advantages.

The Combustion Engineering Co. reviewed its experience over the past ten years in the radiographing of welded pressure vessels, showing that a two-tube 200,000-V air-cooled outfit had proved satisfactory for thicknesses of ½ to 2½ in., but had serious limitations in sensitivity and reasonable exposure time in the heavier plate ranges.

Eliminating Double Inspection

The practice of double X-raying, once at an interstage thickness and again after the welding was completed, was laborious and expensive. A 300,000-V air-cooled industrial unit was superseded by an oil-immersed unit without improvement in sensitivity, but an adaptation of the Bucky grid made it possible to obtain reliable radiographs up to 4 in. thickness though the time of exposure was excessive. Next, a 400,000-V oil-immersed outfit raised the limit of thickness to 5 in. With some later boiler drums of 5½ to 5⅝ in. plate thickness, this machine and Bucky grid required 7½ hours to take individual pictures.

The million-volt unit recently installed at the Chattanooga plant of the Combustion Engineering Co. is housed in a separate building, 21 by 60 ft. with 18-in. concrete walls carried to a sufficient height to ensure protection to all personnel. The control equipment is situated in an ante-room connected with the main room by a concrete maze and has additional lead protection.

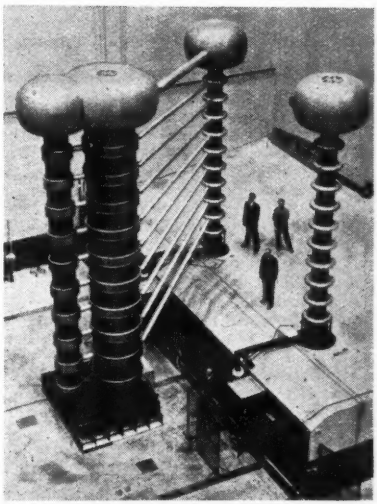
The tube is assembled in a cradle, carried by an overhead crane, and can be traversed in three directions and rotated on trunnions from the vertical to the horizontal positions, making it possible to insert the tube through the manhole in a drum head and at one exposure take a picture of the whole circumferential seam. Thus a great saving is effected not only in the number of exposures but also in the setting-up time.

Lower voltages, even as low as five or six thousand, continue to play important parts in micro-radiography, and the examination of oranges, fats and proteins, in fact, in many branches that lean heavily upon microscopic investigations.

Meeting Service Requirements

The X-raying of navy turbines is an accepted routine; also welds and castings which go into high-pressure steam systems aboard ship. For the U.S. Army, the welds in gun carriages, as well as gun mounts, are subjected to similar scrutiny and certain parts of tanks and other heavy armament materials require radiographic examination. The role played in the aircraft industry is equally important. Many parts require complete examination but in the case of others which may be considered slightly less vital a certain number of each lot is so examined as a check on the standard of quality throughout the manufacturing process.

For normal conditions 60,000 to 140,000 V would be satisfactory for aluminium; 200,000 V for 1½-in. steel and 400,000 V for thicker sections. However, with the defence programme the element of time is vital and has indicated the desirability of higher voltages to attain speed.



This 1,400,000V American General Electric unit, said to be the most powerful in the world, has been installed in the laboratory of the Bureau of Standards, Washington, D.C. It is to be used in measuring high voltage X-ray dosages and the testing of protective materials.

Four more million-volt X-ray units will be in operation shortly. One is being installed at the American Steel Foundries plant at Granite City, Ill.; a second at the Norfolk Navy Yard; and another for a plant at Kuskegon, Mich., where it will be used to inspect armament and motor castings. The chief reason for the Navy Yard installations is to speed up radiographic inspection of heavy walled pressure vessels and to release a number of radium units for use in localities where X-ray service is not available.

Wages in the Cable Making Industry

THE Joint Industrial Council for the Electrical Cable Making Industry states that the cost-of-living index figure on January 1st (100 per cent. above the 1914 level) will not involve any alteration in wages on the third pay-day in February.

Canadian Power Survey

Large Schemes Nearing Completion

REPORTING on hydro-electric progress in Canada during 1941 the Minister of Mines and Resources (Mr. T. A. Crerar) states that for the ten months ended with October the total output was more than 8 per cent. greater than in 1940 and it is thought that the total output for the year will reach a new record of more than 33,000 million kWh. Of greater significance is the increase of 22 per cent. during the first ten months of the year in the power generated for primary use. This indicates the great increase in industrial activity due to war production and reflects the very substantial diversion of secondary energy to primary use.

New water-power installations during 1941 aggregated 254,600 HP, making Canada's total hydraulic installation at the beginning of the present year 8,845,038 HP. There are other undertakings under way which should add more than 650,000 HP to this total during the next year and a half.

Brief details of the more important plant construction in the various provinces are as follows :—

Ontario.—The Great Lakes Power Co. doubled the capacity of its plant at Upper Falls on the Montreal River by the addition of a 10,000-HP unit and the height of the head dam was also increased to permit of the installation of a further 10,000 HP at the Lower Falls plant ; this unit will be in operation in 1942.

The Hydro-Electric Power Commission of Ontario is now delivering power from its new station at Big Eddy on the Musquash River. The installation consists of two units of 4,950 HP each operated by remote control from the Ragged Rapids station four miles upstream. Towards the end of 1940 the Commission commenced work on the development of Barrett Chute on the Madawaska River, where 56,000 HP will be installed under a head of 154 ft.; it is expected that the station will commence delivery of power in July, 1942. Work has recently started on a new plant at DeCew Falls. The installation will consist of a single vertical turbine rated at 65,000 HP under a head of 265 ft. It is planned to have power available in July, 1943.

Ogoki Diversion Project

The Ogoki River diversion project has been well advanced during the year. A dam will divert the river's flow southward from the Hudson Bay drainage through Lake Nipigon into the Great Lakes System to augment the power available at Niagara Falls and on the St. Lawrence River, with a regulating dam at the summit between the areas drained by the Ogoki and Nipigon Rivers. It is expected that the diversion will be commenced in 1943. As a result of special agreements between Canada and the United States, additional diversions of water for power purposes have been made at Niagara Falls. These successive additions total 14,000 cu. ft. per sec., permitting the full-time operation of all generating stations on the Canadian side of the Falls.

Quebec.—Additional hydraulic capacity during 1941 totalled 230,000 HP, including the new 48,000-HP plant of the Quebec Streams Commission on the Upper Ottawa River. The Aluminum Power Co. added 15,000 HP at its Chute-a-Caron generating station where two more 65,000-HP turbines are also being added, one of which is expected to be in operation in March next and the second shortly afterwards. These two units will be transferred later to the company's new Shipshaw plant on the Saguenay River where 510,000 HP is being installed, the initial installation to be in operation about February, 1943.

The Beauharnois Light, Heat and Power Co. added three units of 53,000 HP to its station at Beauharnois on the St. Lawrence River, bringing its installation to 689,000 HP, the greatest in any Canadian generating station.

The Shawinigan Water and Power Co. has added 8,000 HP to the capacity of its La Gabelle and Grand Mere stations (now 172,000 and 197,000 HP respectively) by turbine runner replacement. By improvements to its transmission system it has released some 80,000 HP for the Arvida aluminium works and by gradually reducing the supply of electric boiler power has released 200,000 HP for war industries.

British Columbia.—The West Canadian Hydro-Electric Corporation is adding a 3,000-HP unit to its hydro-plant near Vernon and the Powell River Co. is providing additional storage for its Lois River generating station by the completion of the Scanlon dam to a height of 140 ft.

Power for Gold Mines

North-west Territories.—The construction of the first hydro-electric generating station in the area was completed by the Consolidated Mining and Smelting Co. This plant, on Yellowknife River at the outlet of Bluefish Lake, provides power for gold mines and the settlement of Yellowknife.

Alberta, Saskatchewan and Manitoba.—Work on the Calgary Power Co.'s 23,000-HP plant on Cascade River was commenced and it is expected that power will be available early in 1942.

The Manitoba Power Commission in conjunction with the Department of National Defence constructed 107 miles of transmission line to provide electrical facilities for army and air force training establishments.

Recovery from Shock

ALL employees of one large electrical concern in Canada are trained to administer artificial respiration to victims of electric shocks. It is stated in the *Electrical News and Engineering* (Toronto) that 90 per cent. have been revived when treatment has been started within one minute, but that a delay of six minutes reduces the figure to 10 per cent. A case is recorded of a man who received a shock at 26 kV from head to hand while on a pole. He was lowered and resuscitation was taken in hand immediately and continued for eight hours (requiring the efforts of twenty-five men) until life was restored.

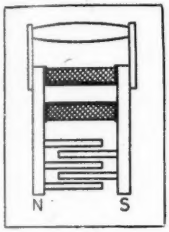
Magnetic Percolators

Cleaning Clay for Pottery

An account of the methods adopted to free clay from the iron particles which mar pottery and undermine its strength

THE most undesirable "foreign bodies" in a clay mixture intended for pottery production are metallic particles. Specks of iron cause ruinous markings in the fired ware and may undermine its strength. The elimination of these particles has always been found a difficult problem by British potters.

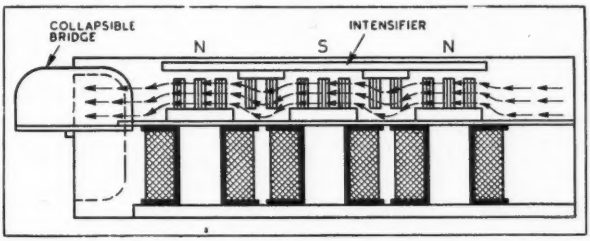
In the nineteenth century permanent magnets of a special shape with poles, each about 10 in. long and parallel rather than horseshoe, were suspended through slots in the cover of the percolator in the "slip," or liquid clay. From time to time the poles were cleaned and re-magnetised. This type of percolator was only partially effective.



End view of early type of magnetic sifter with protruding fingers

Although the magnets were generally staggered, much of the slip eluded them.

Early in the present century the electro-magnetic sifter was introduced. This consisted of a wound core with a pole shoe at each end, from which staggered fingers protruded towards each other below the coil which were immersed in the slip flowing along the trough. Once again part of the slip passed through the fingers without contact so that extraction was incomplete. These magnets, being much stronger than the permanent type were quickly "choked" with iron and required frequent cleaning to maintain their efficiency.



Clay "slip" trough with intensifier armature over electro-magnets

The principal defects in this early electro-magnetic percolator were the comparatively short length of effective magnetic surface edges and the uncertainty of the current. It was then common to generate power on the premises and in the event of a failure of supply the magnets ceased to function and the trapped particles were thereby released and consequently returned to the prepared slip.

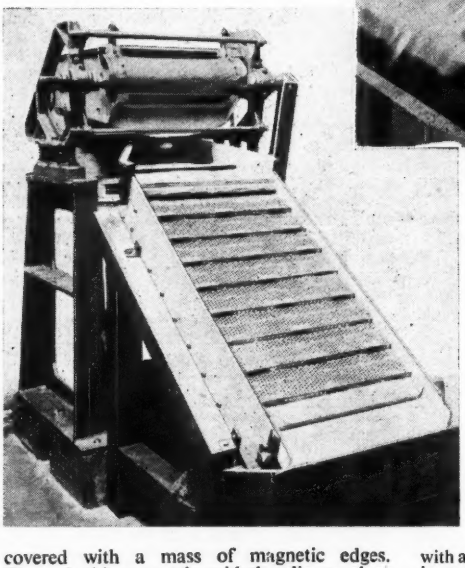
In 1903 the Rapid Magnetting Machine Company patented a percolator which removed most of the difficulties inherent in earlier machines. It consisted of a watertight trough with rows of wound cores, each row being of alternate polarity, mounted on the underside of the trough and covered with iron bars or shoes bolted to the top ends of the cores. The bars were provided with a number of vertical projections of half-moon section with V-shaped serrations facing the direction of the flow. They were arranged transversely across the width of the trough and constituted a series of magnetic dams. The thick bars and projections impeded the flow of the slip so that the inclination of the trough was increased. The bars were easily cleaned by cutting off the slip flow and the current and allowing a charge of water to wash off the collected particles.

Another important improvement prevented spoilage and loss of time due to current failure. This was effected by means of a collapsible bridge fixed at the delivery end of the trough and held in position by magnets on the same circuit as the trough magnets. Failure of the current caused the magnets to release the bridge, thus diverting the flow of slip into an emergency tank. Warning of the disconnection was given by means of an alarm bell. The obvious advantages of this electro-magnetic trough caused it to supersede the permanent magnet and it was adopted throughout the industry.

Another improvement greatly increased the efficiency of the percolator. An armature or magnetic intensifier was placed over but not in contact with the magnets. This had the effect of concentrating the lines of force and intensifying them where most required, the "pull" between armature and magnets being increased by as much as 300 per cent. The "amplifier"

consisted of bars, similar to those of the magnet proper, facing downwards so that the projections were immersed in the slip. When magnetised by induction the projections increased the number of magnetic edges.

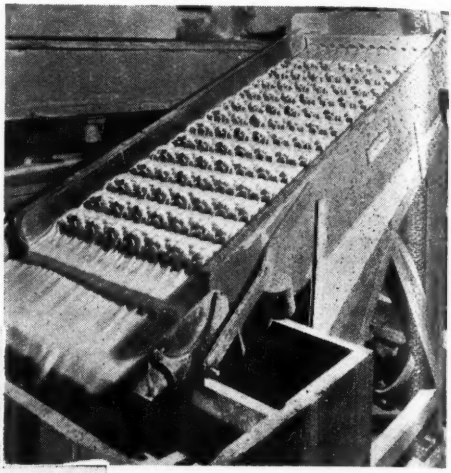
In 1938 the same company patented other apparatus which, while retaining the basic principles of the separator described above, introduced important new features. Instead of the projections and serrations, the new machine has fitted to the top of each magnet bar a box-like frame containing numerous pieces of perforated metal. The mesh thus formed consists of small elongated diamond-shaped perforations. Similar box frames are fitted between each pair of magnets so that the bottom of the trough is



covered with a mass of magnetic edges. Through this magnetic grid the slip or glaze must percolate. The liquid is forced to flow over a succession of dams and is consequently obstructed and searched for metallic particles. Highly magnetic fragments, such as iron and magnetite, are extracted first while the feebly magnetic particles pass on until they meet an edge clean enough to hold them.

The boxes which contain the grids are easily detachable for cleaning purposes and are interchangeable. Power consumption is low; a percolator 24 in. wide with ten magnet units can handle 4 to 6 tons of slip per hour consuming 1,200 W, and a 6-in. model (six magnet units) rated at 180 W has a capacity of between one and two tons of slip per hour.

It should be added that an early defect in this machine has now been rectified. When first marketed the magnets were fitted with boxes containing a wire filling, or sponge, which was affected by the alkaline slips and tended to rot. The substitution of rustproofed, perforated, expanded metal for the original wire has proved to be an adequate corrective.



Typical "slip" percolators with and without clay mixture flowing

Heat-Loss Calculations

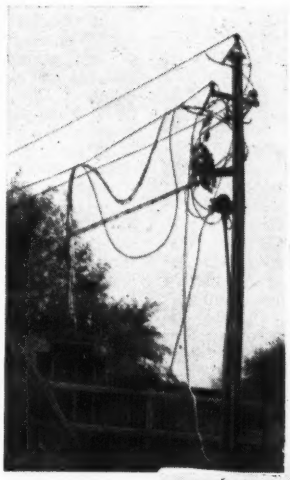
RECOMMENDATIONS for the computation of heat requirements for buildings, extracted from the "Guide to Current Practice" which the Institution of Heating and Ventilating Engineers issued to its members last year with a view to unification, have now been published in separate booklet form in response to many requests for authoritative data needed for heat-loss calculations.

In Part I are tabulated the temperature rise and rates of air change appropriate to many kinds of buildings and industrial establishments. In Part II overall coefficients for walls, floors and roofs are tabulated with allowances for height as well as for intermittent heating. In Part III there are tables of thermal conductivity data for buildings and insulating materials. For the benefit of those not familiar with heat-loss calculations, a typical example has been included in this booklet, which is obtainable for 2s. post free from the Institution of Heating and Ventilating Engineers, 21, Tothill Street, London, S.W.1.

Overhead Line Damage

Effects of High-Explosive Bombs

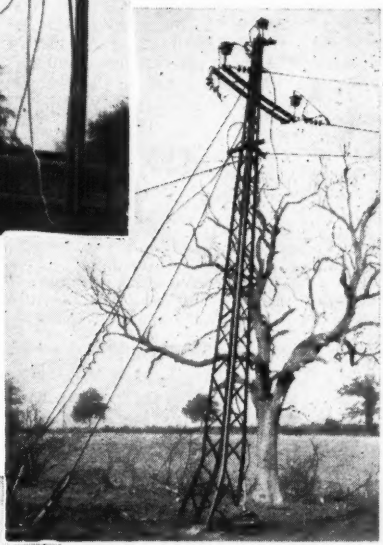
THOUGH any damage caused by bombs to overhead lines is always easily repairable, it is interesting to study a few of the forms it takes. Many engineers fully expected that anything overground, such as overhead lines, in the path of bomb blast would be levelled to the ground, but in actual fact damage has perhaps not reached a quarter of that anticipated. Admittedly near misses have put more than harmonic ripples in the conductors while, especially with pin-type insulators, the conductor binders have been severely strained and have required keen examination and often renewal. It does indeed require direct hits on towers or poles to interfere seriously with supplies, and in transmission

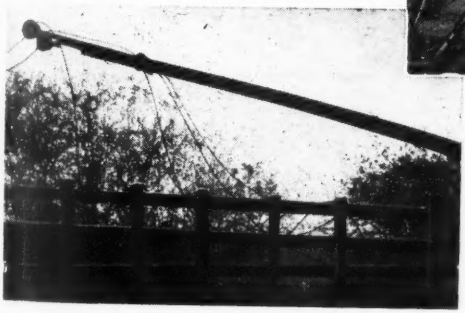


Wooden poles appear to withstand blast better than steel ones

this is a remote possibility. Even if this does occur, at least the excavation for the new tower or pole has, if unintentionally, been provided to assist restoration of supplies! The amount of injury sustained depends, of course, to a large extent on the size and type of bomb and, apparently, it is not the blast, but bomb splinters that are responsible for the damage, the strands of the conductors showing definite evidence of having been severed. In a number of instances bomb fragments have frayed the conductors, particularly where they have been of the stranded pattern, and have made it necessary to replace whole spans by jointing in new sections. Frequently pilot wires have been punctured but not rendered unserviceable, and on many occasions where the conductors only have been frayed or chipped by flying bomb fragments the supply has been uninterrupted.

Sometimes the conductors, or some of the conductors, escape damage in a remarkable way. In the picture of the angle lattice pole it will be noticed that, although the 33-kV lines were cut, the catenary held despite





Effect of H.E. bomb damage on a lattice angle pole: note that all the leaves have been blown off the tree behind, but the main 33-kV conductors on one side of the crossarm, as well as the catenary cable, are undamaged. On the left the H-type steel girder line pole has been bent nearly horizontal as a result of the sudden severing of the conductors by a bomb: the insulators and other overhead line fittings are unharmed

the fact that all the leaves were blown off the tree in the background. On

another occasion a length of railway metal was thrown up to touch the conductors of an overhead line, yet the line itself was unharmed, though the catenary and telephone cables were damaged. There was another interesting example where a bomb fragment passed straight through the leg of a tower, making a ragged hole in the angle section of the leg, but leaving the tower standing perfectly straight and usable.

Engineers in rural areas may have been puzzled by the phenomenon of the protective gear on overhead lines operating during a raid, without there being, on inspection later, any apparent damage to the line to account for it. It seems that this is due to bomb blast causing the lines to whip together momentarily. This was actually seen to happen when one bomb exploded.

The sudden severing of lines has resulted in some curious effects on the supporting poles. The H-girder steel pole illustrated was bent almost level with the ground as a result of the sudden release of tension, but no damage was done to the pole fittings, insulators, etc. Wooden poles, on the other hand, seem to withstand maltreatment much better, and we rarely heard of any being damaged from this cause.

One undertaking with a large rural area and considerable experience of bomb damage reports that in one case only has it had a wooden pole split completely and rendered unserviceable. On several occasions, however, bombs have fallen near to wooden poles, broken insulators and forced the poles out of the upright, while flying bomb fragments have torn small pieces from the poles themselves. This applies equally to 33-kV, 11-kV and low-voltage lines.

Few reports have been received of damage to pole-mounted transformers, and even where it has occurred it has generally consisted only of slight puncturing of the casing, which has not been sufficient to put the apparatus out of commission. In one instance a transformer outer casing was pierced by a bomb fragment which was sufficiently high up to allow oil to escape, but not so much as to reach a dangerous level ; the supply was uninterrupted.

In another case, however, the pole-mounted transformer was not so lucky. It was near a large H.E. bomb, and had the terminal bushings shattered and the casing punctured. Nevertheless, in spite of this, the H-pole on which the transformer was mounted remained standing and was usable again as soon as the undertaking had time to take down the damaged transformer and replace it by a new one. Some of the strain insulators connected to the H-pole were shattered.

Oswego Power Station

ALTHOUGH associated with a hydro scheme, the new 400,000-kW Oswego plant on Lake Ontario of the Central New York Power Corporation, 160,000-kW of which is now in commission, is designed for high thermal efficiency. The first instalment, which is described in the *Electrical World*, consists of two 80,000-kW independent units of vertical lay-out with few cross connections. It contains two B. & W. 900,000-lb. per hr. suspended three-drum boilers, fired with pulverised fuel; stop-valve steam conditions are 1,320 lb. per sq. in. and 900 deg. F. Each boiler supplies one turbine without header interconnection. Water-walls and gas passages are cleared with compressed air at 250 lb. per sq. in. through blowers in pre-set sequence.

Electro-magnetic couplings are employed for the four 1,250-HP induced-draught fans, the four 400-HP secondary-air fans and the four 165-HP primary-air fans. Control of combustion, safety valves, soot blowing and auxiliaries is centralised in one control room. All auxiliaries are electrically driven, taking 6 per cent. of the daily peak. Motors up to 1,750 HP are started across the line.

The turbines are single-cylinder seventeen-stage machines taking steam at 1,250 lb. per sq. in. and 900 deg. F. Steam is bled from six stages in order to reduce water-cutting of the turbine blades under varying load as well as to improve economy. The 13.8-kV alternators are hydrogen-cooled and the 300-kW exciters are used as starting motors for spinning and synchronising the sets for synchronous condenser operation. A device for turning at one rev. per min, is also provided. There are four 50,000-kVA 13.8/115-kV transformers, which give 66,000 kVA with fan cooling. Auxiliary 2,300/575-V transformers adjacent to the air-break 2,300/575-V switchgear are filled with non-inflammable fluid. A heat consumption rate of from 10,700 to 11,100 BThU per kWh is reported.

Surplus Stores After the War

IN a report on the disposal of surplus Government stores after the war, which it has forwarded to the Prime Minister, the London Chamber of Commerce states that it is essential to avoid the destruction of markets and postponement of the restoration of normal industrial activity. These stores should, on the contrary, be used to create new markets, *e.g.*, surplus road-making equipment and lorries if presented or sold at a nominal price to undeveloped Crown Colonies and other countries would create a future market for the motor and ancillary industries instead of choking existing markets. Stocks of other stores could be held to assist in maintaining the stability of the price structure. If these objects are to be achieved it is imperative that the work of disposal should be entrusted to a number of non-profit-making commodity disposal companies, consisting of manufacturers and merchants in the class of commodity to be handled, together with representatives of the Government and the appropriate trade union. In order to ensure the commencement of disposal work directly hostilities cease, a non-profit-making central company should be established immediately to organise "shadow" commodity disposal companies, whose policy it would control

INSTITUTION PROCEEDINGS

Urban Distribution Systems. *Preventing Insulation Failures.*

Solid Low-voltage Networks

CITY distribution of electricity by solid low-voltage cable networks is discussed in the paper by Mr. B. Wood (Messrs. Merz & McLellan) which was presented to the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 11th.

The author recalls that a few years ago Messrs. J. R. Beard and T. G. N. Haldane, when considering standardised design, declared the most economical method to be the use of duplicate high-voltage transformer-feeders in combination with radial low-voltage distribution. Since that time the solid low-voltage network has been widely adopted in other countries, particularly in America. With this arrangement the supply route to any consumer is at least duplicated all the way, which results, it is claimed, in improved voltage regulation and reliability of service.

On the other hand the parallel operation of the transformers introduces unfamiliar problems, such as increased fault duty in the l.v. network and the reverse flow of power from the l.v. network into transformer or h.v. cable faults. This latter has hitherto been dealt with by sensitive reverse-power protection on the transformers, but it now appears that all the requirements can be met by fuse protection.

Advantageous Conversion

With this modification the scheme is worthy of serious consideration for application in this country, and it is thought that with certain precautions as to fault duty in areas of dense loading many existing city distribution systems could advantageously be converted to solid working. The scheme is, however, most attractive where a rather light section of l.v. cable is laid down and is proving inadequate with orthodox methods.

While a solid network offers considerable advantages in improved service to customers, its adoption or rejection is likely to turn on the question of cost. Savings should result from the more effective use of existing copper on both the high-voltage and low-voltage sides, from the simplification of the distribution-centre equipment and from the better utilisation of transformers compared with the conditions in orthodox schemes of distribution.

Interconnection of the low-voltage network offers a further increase of load capacity from existing cables, improved voltage regulation and more reliable service. The meeting of increased load by the insertion of additional distribution centres is greatly facilitated since it does not call for any special arrangement of the l.v. cables. Hence the adoption of the proposed scheme should almost eliminate the laying of further l.v. cable in developed areas, except for the replacement of superannuated cable. It is of particular value in areas where a rather light section of cable exists, such as 0.15 to 0.25 sq. in., and where the load density is below 30 MVA per square mile, conditions such as occur in many poorer metropolitan districts.

Protection can be made perfectly discriminative mainly by means of fuses: the development of the oil-less h.v. fuse, oil-less load-breaking switches and the h.r.c. low-voltage fuse have made this scheme possible. The combination with a non-inflammable transformer construction offers the possibility of a virtually fireproof distribution centre. An increase of rupturing capacity of cartridge fuses may be necessary before the scheme can be applied as freely in this country as it has been in the United States.

Insulation Testing

ON power distribution systems having a large proportion of overhead lines most of the breakdowns occur on these lines, but their consequences are much less serious than those of the less frequent faults on insulation in switchgear and transforming stations. The probability of insulation failure in service can be much reduced by regular field tests, made sufficiently frequently to detect deterioration in time to allow of the removal of faulty insulators before they break down completely. There is no generally accepted way of doing this; the traditional "pressure test" is now agreed to be almost useless because it does not measure leakage or losses.

Central Board's Methods

Power factor is probably the best criterion of condition, according to Messrs. E. A. Burton, J. S. Forrest and T. R. Warren in a paper that was presented at a joint meeting of the Meter and Instrument and Transmission Sections of the INSTITUTION OF ELECTRICAL ENGINEERS in London on February 6th. It deals with the testing methods employed on the Central Electricity Board's system, within the 6.6 to 132 kV range, and describes instruments designed to satisfy the onerous conditions of use in the field. Information is included about the power factor of oil in service.

Of the three wattmeter types of apparatus described for measuring power factor, two operate at 10 kV for bushing tests and the other at 50 kV for busbar tests. Both direct reading and null methods are employed and double screening is provided; the inner screen

eliminates losses to earth in the cable and transformer from the meter circuit and the outer (earthed) screen minimises the effect of interference due to electrostatic induction. Beside the Doble wattmetric outfit developed in America, equipment constructed in England makes use of a sensitive torsion-head dynamometer for measuring the wattage loss. Full-scale deflection is obtained with 0.022W, meaning 2W at 10kV. A capacitance-resistance phase compensator is included in the voltage circuit.

Details are given of a modified form of Schering bridge specially developed for field testing, which departs from the principles associated with former types. Two of the bridge arms on one side are formed by the high-voltage winding of the testing transformer, which is tapped for this purpose near its neutral end, while the other two arms are formed by the bushing under test and a measuring circuit consisting of a condenser and resistor in series, both variable. It will be noted that a standard high-voltage condenser is not used. A high-impedance tuned detector of the thermionic type is connected across opposite arms of the bridge to indicate when a balance has been obtained.

It is not desirable to expect that finality has yet been reached in means of determining the power factor of bushings. In spite of the general level of excellence attained to by the various apparatus described, certain limitations remain which seriously detract from their value to the practical engineer. To give a lead to future investigators the authors refer to tests which they have carried out with the object of demonstrating that suitably designed bushings of the condenser or fibre-barrier type can be tested while in full service, although it is perhaps too early yet to suggest how far "live" power factor testing will develop.

Potential Distribution

There are two main ways of measuring potential distribution. The first determines the difference between a point on the bushing surface and earth by means of a high series resistance and a rectifier type of microammeter. The second measures directly the difference between sections of the bushing surface with the aid of a line-insulator tester made up of an electrostatic voltmeter and series condenser (see ELECTRICAL REVIEW, December 25th, 1936, p. 887).

High insulation resistance may be determined by measuring leakage, when DC is applied by a hand or motor driven ohmmeter, or through an AC transformer in combination with a thermionic valve rectifier. The latter way is particularly attractive because television receiver requirements led to the mass production of components which can be used as a source of DC at about 5,000 V. In addition a cathode-ray tuning indicator (" magic eye ") can be employed as a very sensitive leakage current indicator (see WIRELESS WORLD, July, 1941, p. 178). Such indicator tubes are inexpensive and robust and can easily detect less than 1 μA, so that in 5,000 V tests insulation resistance of the order of 10,000 megohms can be measured (see ELECTRICAL REVIEW, July 25th, 1941, p. 857).

The authors summarise the results of more than 2,000 tests which they have made on installed apparatus; twenty-four faulty bushings have been revealed in time to be taken out of service before breakdown. Methods are suggested of continuously supervising the insulation of important installations in cases in which the low-voltage ends of the insulators can be isolated from earth.

Each of the three methods dealt with in this paper has its own sphere of application, so the test engineer has to select that which is most suitable for the equipment with which he is concerned. Thus if it is necessary to diagnose true dielectric failures, then the power factor test will be best; but if outdoor bushings have to be tested without taking the apparatus out of service the measurement of potential distribution is the only method at present generally available. If trouble is being experienced due to the ingress of moisture into bushings with faulty gaskets, the relatively simple insulation resistance test will enable the affected bushings to be taken out of service. All three basic methods can be employed with advantage on large systems.

Fluorescent Lighting

THOSE who attended the ROYAL SOCIETY OF ARTS in London on February 4th when Mr. H. G. Jenkins (G.E.C. Research Laboratories) read a paper entitled " Fluorescent Lighting " heard a detailed account of the beginnings and subsequent development of fluorescent materials in conjunction with electric discharge lamps, both in this country and in America.

The author said that the first fluorescent material used for lighting purposes was of the zinc sulphide type, introduced into this country by Claude-General Neon Lights, Ltd., for high-voltage cold cathode advertising tubes. The use of these powders demonstrated the wide control of colour which was possible and subsequent developments by McKeag and Randall at Wembley and by Leverenz in America led to the discovery of zinc beryllium silicate which was one of the fundamental materials used in modern fluorescent lamps.

In England the development of a range of sizes and colours was interrupted by the war and the consequent necessity of standardising for industrial purposes upon an 80-W lamp 5 ft. long. This had been so successful that it was probable that production would be concentrated on this size until the end of the war. It had a coiled coil electrode at each end coated with an electron emissive layer which

acted alternately as cathodes. Connected to the cathodes were small uncoated plates which served as anodes. The tube current was controlled by a choke in series with the lamp, while starting electrodes were heated by the passage of the mains current through each in series (for two or three seconds) before an automatic thermal switch broke the connection between the two electrodes and the current passed through the tube, initiating the discharge. A condenser for power factor correction and a small one for radio interference suppression were also generally incorporated.

The fluorescent coating on the inside of the tube had by agreement among the leading English lamp manufacturers, been standardised to give a colour akin to noon sunlight, but almost any variation was possible to experienced manufacturers.

From theoretical consideration, a low-pressure mercury-vapour fluorescent tube giving a colour similar to sunlight had a maximum efficiency of the order of 60 lumens per watt and already commercial tubes were available giving 60 per cent. of this theoretical maximum. Only 40 per cent. of the total energy input to the tube was emitted as infra-red radiation so that, compared with ordinary tungsten filament lamps, fluorescent tubes gave four times as many lumens of visible light per unit of infra-red radiation, with the result that very high lighting intensities were possible without the generation of so much heat as to be uncomfortable to workers.

Fall in Efficiency

The light output of fluorescent tubes fell off as the lamp burned, due to the formation of deposits on the fluorescent coating, which prevent its excitation by the ultra-violet radiation of the discharge. The rate of depreciation depended to a large extent upon the skill of the manufacturer. With present-day tubes the efficiency fell fairly rapidly during the first 100 hours from 35 to 32 lumens per watt and thereafter more slowly until at 2,000 hours the efficiency was about 24 lumens per watt. The tube finally failed when one electrode had exhausted its emissive coating.

The light output of fluorescent tubes was affected by the temperature of the surrounding air; in consequence, they had been designed to give their optimum light output (when operating in a fitting) at a tube temperature of about 45 deg. C. which corresponded to ordinary working conditions.

Although over-running the lamp increased the light output, it reduced the efficiency and under-running might reduce the life of the lamp because the electrodes were not sufficiently heated. There was no noticeable change in the colour rendering of the tubes during life, although old tubes generally appeared slightly pinker in colour than new tubes, due to the differential depreciation in the efficiency of the various powders.

The stroboscopic effect in fluorescent mercury lamps was less than that of plain mercury lamps, owing to the phosphorescent character of the coating, while a considerable improvement in this connection might be obtained by operating the lamps in pairs, one controlled by an inductive choke and one by a capacitative reactance.

Annealing Glass Bottles

YESTERDAY (Thursday), Mr. H. T. Young, the first chairman of the Installations Section of the INSTITUTION OF ELECTRICAL ENGINEERS, was to give the address which he was prevented by ill-health from delivering at the inaugural meeting of the Section. We hope to report the address in our next issue. The address was followed by a paper dealing with the application of electricity to the annealing of glass bottles and containers by Mr. E. S. Morris (United Glass Bottle Manufacturers, Ltd.).

In explaining the primary importance of annealing commercial glassware the paper outlines the nature of the processes involved, tracing their development stages from brick arches to portable and continuous lehrs, indicating transition from coal to producer gas and oil firing and finally to complete electrification. Insulation factors and methods, heat conservation and re-application, cooling gradations, economic and product-quality considerations favouring the use of electric power and heating elements are all made the subjects of explanatory data. A brief account is included of tumbler-edge glazing and enamelling, which involves the processing of pre-annealed cold ware.

The processes described are said to have revolutionised the industry during the last twenty years. In a factory with an average output of 1·25 million units per day the annual consumption is 28 million kWh.

Comparison of Costs

The paper shows that a 4-ft. lehr loaded to 21 kW (drum and side heaters) uses 1,718,640 BThU per 24-hour day, costing 21s. at 0·5d. per kWh. A 4-ft. lehr for pressed ware loaded to 29 kW (mattress elements) uses 2,373,360 BThU per day, costing 29s. A brick lehr uses 250 gallons of oil, or 46,200,000 BThU per day, costing £6. Thermostatic control, in addition to maintaining constant predetermined temperatures, assists in minimising the consumption of electricity.

Lehr drive is by 1-HP motor through reduction gears with the aid of inverted-tooth chains and a variable speed gear-box, so that the mattress speed may range from 3·5 to 14 in. per minute. The drums over which the conveyor mattresses run are specially surfaced with rubber, to enable the mattress to be kept taut. Air cylinders or weights on either side maintain correct tension.

Hours and Output

Health Research Board's Report

A REPORT on hours of work, lost time and labour wastage has been presented by the Industrial Health Research Board of the Medical Research Council (Emergency Report No. 2, Stationery Office, 6d. net). Among the members of the Board, whose chairman is Sir W. Wilson James, Chief Medical Officer of the Ministry of Health, are Mr. R. E. Lane, M.B., F.R.C.P., Medical Officer to the Chloride Electrical Storage Co., Ltd., and Sir Henry H. Bashford, Chief Medical Officer of the General Post Office.

The report is largely an expansion of the matter contained in the 21st and 25th Reports of the Select Committee on National Expenditure; the latter report containing departmental comments on recommendations made in the former, was reviewed in our issue of November 21st last. It is a study of the extent to which the lengthening of the weekly working period means increased output. A statement attributed to a foreman that "Sunday work means six days' output for seven days' work on eight day's pay" contains a germ of truth, but there is no doubt that an increase in output can be obtained even though the hourly average output may be reduced. The Board says that it is for management in conjunction with the representatives of labour to find out where the average hourly decrease neutralises the effect of the longer working day—in short, at what stage longer hours cease to be productive.

Suggested Limits

Earlier investigations by the Board indicated that, over an extended period, weekly hours of work should not exceed 60 for men and 55 for women, and the Ministry of Labour considered it desirable to take all possible steps to restrict hours to these limits rather than await the results of further investigations which were unlikely to produce different indications. It agreed, however, that inquiries should be made in sections of industry or particular kinds of work where it seemed desirable to do so and the Board has proceeded on these lines.

The records of lost time prepared by factories usually refer to absenteeism during the normal 47-hour week and take no account of lost overtime, which is relatively much higher; hence the total loss is underestimated. Subject to this limitation the results of the inquiry show that the time lost due to sickness, injury and absence without permission, when undisturbed by other extraneous factors, varied directly with the weekly hours of work. It was usually reasonably low when the hours were less than 60 per week but was higher, in some cases excessive, when the hours were from 65 to 75; sickness was responsible for a substantial part of the time lost.

The second part of the report contains the results of studies of particular groups of workers which took into account a number of permanent and transient factors. It is shown that the emergency brought about in May, 1940, by the collapse of France, with the accompanying need for greater output, provided a strong stimulus and there was an immediate spurt in production. Later the effects of strain and fatigue became apparent and there was a rapid rise in the amount of time lost through sickness, injury and absence without permission. This adverse tendency was arrested by a reduction in hours which caused a definite improvement in the mental and physical health of the workers and also stimulated the incentive to work by eliminating the double pay for Sundays which were cut out of the programme. Excessive hours were also found to have a bad effect on the machines because of the greater wear and lack of time for adequate overhauls and repairs. Holidays reinforced very strongly the beneficial effect of the reduction of hours.

Response to National Appeal

Reference is made to adverse effects upon output of air-raid warnings, and also to the fairly steady increase in the rate of working due in part to the cumulative effect of gradual improvement in organisation and methods of work. The Board states that the higher hourly output observed in most groups from June, 1940, to March, 1941, despite the longer hours of work, is evidence of the increased effort made by the workers in response to the national appeal for more production.

Wastage of labour was studied for ten factories and it was found to vary considerably. Where it was high it was attributed to a number of factors such as rapid expansion of industry involving the employment of many people (especially women) unused to factory life; the employment of an increasing number of married women with domestic responsibilities; the strain imposed by having to travel long distances to work; air-raid effects on home life and transport; the lack of facilities for meals in some factories; and the inadequate supervision of new workers.

Labour wastage was due largely to workers leaving of their own accord; there were few dismissals. It was reduced by the Essential Work Order of April, 1941, though there was evidence that some workers were able to evade the Order. There were also some complaints by managements of lack of support from National Service Officers.

PERSONAL and SOCIAL

News of Men and Women of the Industry

Cabinet Changes.—Last week it was announced that Lord Beaverbrook had been appointed Minister of War Production and that he was to be succeeded as Minister of Supply by Sir Andrew Duncan who held that position before taking over the Board of Trade. Col. J. J. Llewellin becomes President of the Board of Trade.

It is stated in the report of the Yorkshire Electric Power Co. that **Mr. R. Armitage** has resigned his position as joint deputy chairman, but continues to serve as a director. **Mr. R. W. Wickham** has been appointed joint deputy chairman in his place In 1939 Mr. Armitage resigned from the chairmanship of the company on medical advice and was succeeded by **Sir R. Geoffrey Ellis, Bart.**

Mr. J. E. Rylands has resigned from the position of general manager of Electricity House, Ltd., an associated company of the Yorkshire Electric Power Co., and **Mr. J. M. Twiss,** sales manager, has been released for the duration of the war to take up more important work. All communications in future should be addressed to the company's head office at Bramhope, nr. Leeds.

The marriage took place on January 31st at St. Peters, Vere Street, W., between **Capt. Alex Young,** R.A.O.C., and **Miss Joan Madeline Stephens,** M.T.C., only child of Mr. and Mrs. J. Newton Stephens, of Hampstead, N.W.2. Mr. J. Newton Stephens, M.I.E.E., is connected with Associated Electrical Industries, Ltd., and is a director of the Edison Swan Electrical Co. He is also chairman of the E.I.B.A.

It has been necessary to reorganise the work of certain officials in the Liverpool Electric Power and Lighting Department, to whom has been allocated the work previously done by former officials. The reorganisation of staff involves the following changes:—**Mr. L. Edwards,** senior mains engineer, becomes high voltage mains engineer; **Mr. W. R. Willis,** technical assistant, becomes senior district mains engineer; **Mr. G. Preston,** street lighting mains inspector, becomes overhead mains engineer; **Mr. W. J. Mayhew,** assistant superintendent of substations, becomes superintendent; **Mr. H. Prendergast,** district mains superintendent, becomes district high-voltage engineer; **Mr. H. J. Fraser,** assistant h.v. distribution engineer, becomes senior h.v. distribution engineer; **Mr. J. V. O'Neill,** constructional engineer, becomes h.v. constructional engineer; **Mr. R. C. Burton,** domestic maintenance engineer, becomes commercial and industrial heating engineer; and **Mr. A. Priestly,** assistant superintendent workshops, becomes workshops superintendent.

The Liverpool Electric Power and Lighting Committee has recommended **Mr. W. J. Latimer,** works superintendent of the Lighting Department, for the position of deputy lighting engineer.

Dr. Harry Barron, who broadcast a talk on February 6th on "Synthetic Rubber," is head of the Plastics Department of Pirelli-General Cable Works, Ltd., and a member of the Plastics Panel of the Cable Makers' Association. He is the author of "Modern Rubber Chemistry."

Mr. G. T. Hyslop has been appointed joint managing director of the Phosphor Bronze Co., Ltd., **Mr. J. L. Hardy,** who was formerly joint managing director with **Mr. W. Smithson,** having relinquished this appointment, due to pressure of other business.

Obituary

Mr. W. R. Davies.—The death is reported of Mr. Walter Reginald Davies, J.P., at the age of eighty-one. Mr. Davies had had a very long association with the electricity supply industry. He joined the board of the Brompton & Kensington Co. in 1888 and subsequently became chairman of that company and the Chelsea Electricity Supply Co., Ltd. Upon the amalgamation of these companies in Central London Electricity, Ltd., in 1937, he joined the boards of this concern and of the London Associated Electricity Undertakings, Ltd., but retired last year on account of ill-health.

Mr. Louis Thurner, whose death on January 30th was briefly recorded in our last issue, was 73 years of age and had occupied the position of managing director of Falk, Stadelmann & Co., Ltd., for 29 years, having been appointed on the death of Mr. S. Falk, founder of the company, in 1913. His connection with the company dated back to 1886. In the early days he identified himself almost wholly with the gas supplies section of the business. As the electrical industry grew, this side also came within his purview and, under his guidance, the company extended generally its interests in the lighting and heating industry. Mr. Thurner visited many parts of the world on the company's behalf and was responsible for establishing branches at Melbourne and Sydney in Australia and at Wellington in New Zealand. He took a deep interest in the welfare of his workpeople, and it was due to his solicitude that a staff pension fund was established some years ago. He leaves a widow, daughter and a son, Capt. Walter Thurner, serving with H.M. Forces.

The late Mr. L. Thurner

The funeral took place at Golders Green Cemetery on February 3rd, and was attended by a large number of relatives, friends, and many of the staff from Farringdon Road. The central offices were closed entirely on that day to give employees the opportunity of paying their last respects.

Mr. Henry Mozley, Burnley's former transport manager, died on February 4th, aged eighty-seven. Going to Burnley in 1882 to take charge of the undertaking then owned by a private company, he was appointed secretary when the Corporation took over and became manager in 1901. He retired in 1930.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Bulk Supplies

TO argue from the particular to the general is not very logical. Perhaps the use of the relative term "small" is not altogether satisfactory, although frequently used. Actually, it was intended generally to refer—obviously, I thought—to undertakers not operating selected stations at the inception of the scheme. By inference, a fuller explanation is given in lines 15 to 17 on page 108 of your issue of January 23rd.

Two main ideas behind the Act of 1926 were:—(*a*) a cheap and abundant supply of electricity; (*b*) selected station owners not to pay more, but possibly less in due course.

With the political acrobatics of which Mr. Purse had experience I have no concern. The article gave certain facts which are not fully appreciated. Merely to ignore these in sweeping statements does not alter them.

Manchester. J. L. CARR.

French Railway Electrification

YOUR correspondent who contributed "French Electrical News" on page 184 of your February 6th issue has got a bit mixed up. The railway to the Valley of the Chevreuse started at the smoky underground station of the Luxembourg; it belonged to the Orleans Railway. Over ten years ago the Metropolitan Railway of Paris decided to take it over and special standard gauge electrical stock was constructed to operate the line. The sections of the line which served suburban areas were operated electrically before the outbreak of war, the rural remainder of the line was operated by steam, although in 1939 there were signs that the extension of the electrification would be pursued actively.

The terminus at the Bastille belonged to the steam-operated Vincennes line of the Est Company, which served Neuilly-sur-Marne, La Varenne and the loops of the Marne river; it was closed because it did not pay. A series of smoky tunnels and the extension of the Metropolitan Railway to Vincennes were undoubtedly factors. It used to be operated with quaint-looking carriages and ancient but powerful-looking locomotives. With the layout of the station, which reminded one of the work of Brunel, one could well imagine ladies with poke bonnets and crinolines bundling into the trains.

At one time the Metropolitan Railway, which belongs to the City of Paris but is leased to a company for operation, had a scheme to extend the Vincennes railway from the Bastille right across Paris to St. Germain in the west to form an express interconnecting line, and also to extend the former mentioned line from the Luxembourg to St. Michel the centre of the Latin Quarter and on to the Le Bourget aerodrome to the north of Paris, to form a second express route.

It is of interest that the original power station of the Metropolitan Railway in the Quai de la Rapée, on the river above Notre Dame, has been transformed to supply steam heat to an area of the city through insulated pipes laid under the streets. A series of articles of mine on the "Development of the Metropolitan Railway of Paris" appeared in *Engineering* early in 1933.

THEODORE RICH.

Woldingham, Surrey.

High-Pressure Steam

IN your issue of December 26th, 1941, there appeared an article entitled "High-Pressure Steam" by S. B. Jackson, in which I was much interested, particularly in the section dealing with the boiling out of high-pressure boilers. I should be very interested to receive further information from your readers in regard to the chemical analysis involved, particularly in relation to the use of calgonite.

The procedure adopted in the case of boiler installations with which I have been associated differs considerably from that outlined by the author. In a recent boiler installation in which the working pressure and temperature are 600 lb. per sq. in. and 800 deg. F. the boiling out was done in two stages. First with soda-ash at atmospheric pressure for twenty-four hours, the proportions being 250 lb. per 1,000 gal. of water. The oil emulsion formed on the surface of the water in the drum was scummed off through the manhole before blowing down. After being blown down, the boiler was filled up again, charged with tri-sodium phosphate in the proportion of 250 lb. per 1,000 gal. of water, together with 4½ lb. per 1,000 gal. of sodium aluminate and boiled out for twenty-four hours at a pressure of about 200 lb. per sq. in.

Sodium aluminate forms an aluminate flock with the decomposed particles of oil causing a precipitate which can be removed from the mud boxes. When the boilers were washed out, there were no evidences of grease and the surfaces were found to be in good condition, with a slight deposit of tri-sodium phosphate. In view of the foregoing, the point in the article that particularly interests me is the very small quantity of chemicals used in comparison with that which we have recently used.

Newcastle-on-Tyne. H. MAHON.

COMMERCE and INDUSTRY

Further Export Control.

Rubber-insulated Cables

IN order to conserve productive capacity in the electric cable industry to meet the growing demands from the Services it has been decided that on and after February 16th, orders placed for wires, cables, or flexible cords, insulated with rubber, or with substitutes for rubber, must be accompanied by a certificate obtainable from the supplier to the effect that the whole of the material specified therein is required for essential national purposes. The industry and its authorised distributors have already been advised of this requirement.

Control of Electrical Exports

The exportation of plates and grids for lead-acid accumulators is subjected to licence by the Export of Goods (Control) Order No. 5, 1941 (S.R. & O. No. 172, price 1d.). The same Order also provides that the existing licensing requirements with respect to certain other goods are superseded by the requirement that licences will, in future, be needed for their export. These goods include instruments for indicating, measuring, recording or testing electrical properties or quantities; pyrometers; fittings wholly or mainly of metal of a kind used for street or interior lighting; iron and steel conduit fittings for electrical wiring; wiring accessories and fittings, wholly or mainly of metal, of a kind commonly used for domestic purposes; and wireless valves (including such valves exported as parts of wireless transmitters, whether or not packed separately) and other electric discharge tubes and parts thereof.

It is stated by the Board of Trade that "applications for licences to export the articles made wholly or mainly of non-precious metals specified above will not, normally, be entertained."

Broadcasting and Fuel Economy

In its 24th report the Select Committee on National Expenditure recommended that the broadcasting services should be reduced as a means of saving fuel. The Minister of Information has since informed the Committee that investigations and tests carried out under the supervision of Col. J. C. Dalton have shown that only a very small saving could be effected by this means. If broadcasting were stopped at 10.30 p.m. the saving in coal consumption, it is estimated, would be just over 0.5 per cent. of the total consumption during the November-March period.

Eliminating Bottlenecks

Some details were given this week of the excellent work being carried out by the Capacity Clearing Centres established by the London and South Eastern Regional Board as a means of linking up machine-tool capacity with labour supply and so ensuring that no opportunity for speeding production is overlooked. Explaining the objects of the Clearing Centres, Mr. Simon Marks, acting chairman of the Board, pointed out that the war had changed the character of production of the vast majority of manufacturers. At each Clearing Centre information of these changes is collated, together with details of facilities available for undertaking particular types of work or supply particular types of product. This information, with other advice, is available at no cost whatever to all manufacturers in the area.

Factory Supply Systems.

The success of the organisation can be seen from the fact that in the first ten months the Board's ten Centres made nearly four thousand effective introductions between firms, involving the production of all kinds of war stores. The contracts thus arranged mean the elimination of so many bottlenecks holding up the production of main contracts. The system, further details of which may be obtained from the secretary of the Board, Mr. F. A. Copp, Brettenham House, London, Lancaster Place, London, W.C.2, is being extended to other parts of the country and altogether there are now about thirty-five of these Centres in operation.

Fire Pumps for Factories

It has been arranged that over 2,000 light trailer pumps belonging to the National Fire Service shall be made available to private fire brigades in factories and commercial establishments and to local authorities for fire-guard parties. Conditions of loan are that there shall be trained crews to man the pumps during an alert and that supplementary water supplies of not less than 5,000 gallons shall be available on the premises.

New I.E.S. Branch at Bristol

A preliminary meeting for the formation of a local branch of the Illuminating Engineering Society was held recently at Bristol, Mr. E. J. Taylor (chairman, Bristol Development Board) presiding. Mr. W. J. Jones, president of the Society, spoke of the value of scientific lighting in factories, commercially and in the home, and referred to the need for collaboration with architects to ensure provision for adequate lighting when buildings were being planned.

Factory Distribution

The metal-clad bar system of overhead electricity distribution within factories and similar large buildings is described in a 30-page brochure, illustrated with photographs and dimensioned drawings, which we have received from Marryat & Place, Ltd., 40, Hatton Garden, London, E.C.1. Apart from advantages claimed for this system, its manufacture, layout, installation and accessory components are all explained in some detail, showing that recently completed installations have included capacities up to 20,000 A per conductor, while in one case the resistance of all conductor joints was well below the guaranteed value of twenty millionths of an ohm per joint. There is nothing to burn, since all insulators are glazed porcelain, and the metal casing affords satisfactory earthing continuity although leakage trips can be added for alternative protection.

High-rupturing-capacity fuses protect every individual subcircuit, which can be isolated by simply withdrawing distributor fuses from the bar-tapping box. Additional connections are made

with plug-in fuse tapping boxes and wiring in the ordinary manner, simplicity being an inherent feature of the system, which compares favourably in appearance with multiple cables or conduit and saves much valuable time spent in tracing out circuits when a multiplicity of main sub-fuse-boards is installed.

I.M.E.A.'s Return to London

A week or two ago we mentioned that the Incorporated Municipal Electrical Association was moving its headquarters from Leicester back to London. Now we are told the Association's address as from March 2nd will be Wellington House, 125-130, Strand, London, W.C.2. (Telephone: Temple Bar 1882.)

Electrical Benevolence

The urgent and growing need for electrical manufacturers to support the E.I.B.A. is cleverly interpreted by "Fougasse" in a number of sketches reproduced on a letter which we have received from Mr. E. S. Conradi, managing director of the British Central Electrical Co., Ltd., together with a leaflet setting out six convincing reasons why manufacturers should help in the Association's work. The extent of the need is depicted by an exceptionally large hat. Mr. Conradi comments that he does not expect this to be filled, but asks that a generous response should be made. Typical examples are given of cases in the manufacturing section of the industry where the Association has helped. The address of the E.I.B.A. is Little Gaddesden House, near Berkhamsted, Herts.

At the recent annual general meeting of the Northern Counties Area of the Electrical Industries Benevolent Association the chairman (Mr. E. J. Edgar, North East Coast Manager, Central Electricity Board) reported that subscriptions and donations received during the last year amounted to over £900, which was approximately £300 more than in the previous year. This increase was due to an amount of £329 from the charity gift scheme organised by a sub-committee of the E.D.A. Northern Counties Area under the chairmanship of Mr. W. F. T. Pinkney (North-Eastern Electric Supply Co., Ltd.). The meeting received with regret the resignation of Mr. J. Gledson, hon. treasurer, who had been a member of the Committee since its inauguration and treasurer for the last 23 years. Mr. W. Herbert Ord (North-Eastern Electric Supply Co., Ltd.), the present hon. secretary, was elected to carry out the dual role of hon. secretary and treasurer. The meeting elected Mr. L. E. Mold, O.B.E., M.I.E.E. (director, A. Reyrolle & Co., Ltd.) to the chair and Mr. E. H. E. Woodward, B.Sc., M.I.E.E., M.C., T.D. (general manager, North-Eastern Electric Supply Co., Ltd.) as vice-chairman. The retiring Committee was re-elected with Mr. R. H. Davison (A. Reyrolle & Co., Ltd.) as hon. secretary to the Relief Sub-Committee.

Kempe's Year Book

The forty-eighth annual issue of Kempe's Engineer's Year Book, 1942 (edited by L. St. L. Pendred, Pp. 2852; illus. Morgan Bros. (Publishers), Ltd., 28, Essex Street, W.C.2, price 35s.) is of especial value in that it represents a quinquennial revision of the "formulae, rules, tables, data and memoranda" that are here presented to engineers in all categories. Its forty-seven main sections have been brought up to date and new material has been incorporated. Those relating to steam,

Contractors' Notes

Country Allowance. Building Control. Contract Conditions.

THE National Working Rules of the electrical contracting industry have been amended so far as country allowances are concerned. Hitherto men sent to jobs which necessitate their lodging away from home have received 3s. 6d. a night for the first fortnight and 3s. a night thereafter. The 3s. 6d. allowance is now to be paid throughout as from the second pay-day in February, including nights covered by that pay-day.

The Ministry of Works and Buildings has issued some "Notes for the Guidance of Applicants" in connection with the control of building operations under Defence Regulation 56A which, it will be remembered, affects electrical contractors. Members of the Electrical Contractors' Association have had their attention drawn by the Director (Mr. L. C. Penwill) to their liabilities in cases where the total cost of building work (including electrical installation work) exceeds £100. It is emphasised that where work is done in contravention of the Regulations the person for whom the work is being done or the person undertaking the work is guilty of an offence.

Consequently it is necessary for contractor to make sure that any work which he is asked to do shall not be in excess of the limit or is covered by a licence. Some E.C.A. members have found difficulty in ascertaining the position and so the Association has drawn up a form of declaration to be signed by the client for electrical work before the work is begun. While the possession of this declaration would not necessarily be a complete defence in the case of a prosecution, the Association's solicitors are of the opinion that such a document might be a very effective way of showing that the contractor had reasonable grounds for believing that he was not infringing, or helping to infringe, the Regulations.

We are informed by Mr. Penwill that the standard conditions of tender and contract for electrical work issued by the Electrical Contractors' Association have been revised on legal advice. Section I (General) has been amended to embody the final note in a new clause (*e*) which stipulates as follows:—"Whilst we remain on site we shall be considered as remaining in possession of all materials, plant and machinery, even if bolted or screwed or similarly affixed to the premises, and shall have a lien upon all such materials, plant and machinery for the whole of any unpaid balance of the purchase money due to us."

This has necessitated the amendment of the terms of payment clause (2) to enable the contractor in the event of default in payment to "remove and dispose of all materials, plant and machinery save such as have been so affixed as to be irremovable without serious damage to the premises."

hydraulics, marine oil engines and mining have been re-written by R. H. Parsons, P. L. Bouchier, A. P. Chalkley and Sir Richard Redmayne. Long abstracts from the London Building Regulations have been added to the data on building.

The practical utility of the section entitled "Electrical Engineering," by H. Rissik, has been considerably increased by the care taken in revision to ensure that information regarding the Electricity Commissioners' and I.E.E. Regulations and B.S. Specifications is the latest available. It contains 138 pages, approximately the same number as before, but this by no means represents all the space given to electricity, which is dealt with also under other headings such as Lighting (W. J. Jones), Electric Traction (H. Rissik) and Radio Communication (Editor, *Wireless World*), as well as in numerous sections involving the applications of electricity in one form or another.

The descriptive sections, which contain useful notes on the products of many leading manufacturers, have been extended and the index has been revised and now occupies 72 pages.

Transmission Pole Prices

New maximum prices and conditions of sale are laid down in the Control of Timber (No. 23) Order which became operative on February 9th (Stationery Office, 3d.). Among the classes of timber affected are home-grown telegraph and transmission poles.

Prices of Electric Clocks

The Central Price Regulation Committee has approved prices for synchronous electric clocks manufactured by members of the British Clock Manufacturers' Association and the Synchronous Clock Conference at pre-war list prices, plus 25 per cent. as from February 16th.

Catalogues for Norwich

The Norwich Corporation Electricity Department asks electrical suppliers to send complete copies of all current catalogues in order to assist in the formation of a catalogue library for use of the central purchasing section shortly to be introduced.

Change of Address

The new permanent address of the Liverpool depot of the Edison Swan Electric Co., Ltd., is 23, Stanley Street (telephone: Advance 4944).

E.A.W. Activities

The Liverpool and District Branch of the Electrical Association for Women has just held its eleventh annual meeting—a most successful and well attended one. The president of the Branch (Alderman Mrs. F. C. Wilson) presided, supported by Mr. P. J. Robinson, city electrical engineer, and the Lord Mayor (Sir Sidney Jones) came on from another meeting and took tea with the members, congratulating them on the success of their year's work. "Communal Feeding" was the subject chosen by Miss E. M. Benson, the Corporation supervisor of meals services, for her address. It was her conviction that communal feeding would improve the physical standards of a section of the population. The four British Restaurants in Liverpool were working to capacity and others were being established, while the school meal services were being considerably extended, envisaging midday meals for upwards of 20,000 school children. Mrs. R. L. Burns, J.P., was re-elected chairman of the Branch for the current year, Mrs. E. L. Morland, vice-chairman, Miss Rita Brown, hon. secretary and Mrs. W. Patterson, hon. treasurer.

New Catalogues and Lists

Metropolitan Electric Supplies, Metway Works, King Street, Brighton.—List No. 61241 of replacements for electric fires, kettles, cookers and water heaters.

Barrie's Electrical Agencies, Goldstone Crescent, Hove, 4.—An illustrated and priced leaflet of electric lampshades for commercial and industrial use.

TRADE MARK APPLICATIONS

AMONG recent applications for British trade marks are the following, objections against which may be entered within a month of February 4th:—

CO-AX. No. 616,847, Class 9. Wireless instruments and apparatus and component parts thereof, and electric cables. Bertrand Zucker, 3, Burke's Parade, Beaconsfield, Buckinghamshire.

PERIBRAID. No. 616,620, Class 17. Electrical insulating sleeving made principally of synthetic resin covered by textile braid cemented to the sleeving. Suflex, Ltd., Suflex Factory, Aintree Road, Perivale, Greenford, Middlesex. To be associated with No. 570,874 (3055) (i).

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have the present addresses of the following:—

BALDWIN INSTRUMENTS.
MICROFUSES, LTD.

The "Normandie"

AT the time of going to press it was not certain whether the *Normandie*, in which a serious fire was raging, would be saved. This French ship, caught in New York harbour upon the outbreak of war, had been taken over by the United States Government and rechristened *Lafayette*.

The *Normandie*, with a displacement of 80,000 tons, was launched in 1932 and made her maiden voyage in 1935. Her power plant comprised four main 33,400-kW turbo-alternators for propulsion, six 2,200-kW DC sets for auxiliaries, power and lighting and two 150-kW Diesel emergency sets. The propulsion motors, five of them, were rated at 40,000 HP each.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Improved Control-Panel Cabinets

IN comparing the new Type 939 control-panel cabinet housings of the IGRANIC ELECTRIC CO., LTD., Redford, with those of earlier design, one might well be excused for assuming that the neat and pleasing appearance is the sole factor which influenced their adoption. It is, however, the more important details of construction and design which reveal the main considerations of the manufacturers.

The use of sheet-steel throughout effects substantial economy in material and weight, and this is the fundamental difference between the new and the old housings. All the instruments, push-buttons and switches are flush mounted in the door panel and they are situated at a height convenient to the operator.

The framework is independent of the actual housing, which, apart from a saving in production costs as the result of the improvement in assembly methods, enables the user to withdraw the entire panel merely by undoing one or two bolts, in no way interfering with the actual housing. The framework carries the various panel sections, which, in turn, are independently mounted, thus rendering any modification a comparatively easy matter; only the particular section involved need be changed.

Economy in material and weight is the fundamental feature of the new Igranic Type 1939 control-panel cabinets

By virtue of the perfectly clean cabinet sides, several cabinets may be ganged with minimum delay and alteration. The door-handles have provision for padlocking. An isolating switch may be provided and this can be mechanically interlocked so that it is impossible for the doors to be opened unless the isolating switch is "off."

In some cases the design permits the resistance to be housed inside, when louvre ventilators are arranged on the crowns of the housings. Generally, however, the resistances are mounted on the crowns, thus saving a considerable amount of floor space, while they do not detract in any way from the general pleasing appearance of the cabinet.

A lift-off door at the rear of the panel permits access to the back connections for inspection and maintenance.

Plastic Sleeving

Electrically insulating sleeving which is reinforced in the sense that it is manufactured with an internal layer of closely woven silk braid bonded to the plastic material is stated to have been developed at the request of the Air Ministry by ASSOCIATED TECHNICAL MANUFACTURERS, LTD., Vincent Works, New Islington, Manchester 4.

This type of sleeving, known as "Permanoid" VS grade, is now being made in various sizes in continuously operated plant that is believed to be the first of its kind used in this country. The fabric strengthening minimises softening of the insulation and its partial displacement in consequence of heat drifting when tags are soldered to conducting wires covered with sleeving. It is also an added safeguard when conductors are overloaded, since by raising the temperature gradient the silk obstructs the transfer of heat from the core metal to its plastic covering.

While the sleeving is normally flexible, harder grades can be supplied for withstanding higher temperatures, being also suitable for covering switch keys, breaker bars, or electricians' tools. Breakdown values range from 1,500 to 12,000 V according to wall thickness, and the tensile strength is of the order of three tons per sq. in.

The plastic substance is largely vinyl chloride, which does not support combustion, being more likely to char in flame than to burn. It is resistant to water and oils as well as dilute acids and alkalis. It is said to be stable, both physically and chemically, without tendencies to crack or age, so retaining the several colours in which sleeving is offered. The VS grade is stated to have received Air Ministry approval for use as "high-tension" sleeving and to be suitable for service in tropical climates.

Keep on collecting your waste paper

ELECTRICITY SUPPLY

Glasgow Refuse Works. Failures at Inverness.

Barrow-in-Furness.—MAINS EXTENSIONS.—It is proposed to extend mains to supply the Miners' Arms, Stainton, at a cost of £81; to Ellerside Farm, Holker (£182); Ironworks Road (£94); and Greenmoor Farm, Pennington (£67).

Brighouse.—MODIFIED-LIGHTING EXTENSIONS.—A suggestion by a sub-committee of the Street Lighting Committee that modified lighting should be provided to some extent in the outer areas of the borough has been approved by the main Committee.

Glasgow.—GENERATING SET FOR SCHOOL LIGHTING.—The Education Committee has accepted an offer by the Electricity Department to install a 7-kW Petter-Crompton lighting set at Mossbank School, Ardgci'. The director was authorised to arrange for the erection of an engine and battery house.

POWER FROM REFUSE WORKS.—The Central Electricity Board has suggested to the Cleansing Committee that steps should be taken to increase the output of electricity from the refuse works by burning coal during emergencies. The Committee has agreed that the director of cleansing, in conjunction with the refuse works manager and the general manager of the Electricity Department, should be instructed to discuss the technical details involved with the Central Electricity Board, and that the whole matter should then be referred to a special sub-committee.

Inverness.—PROTEST AGAINST SUPPLY FAILURES.—The Town Council is to send a strong protest to the Grampian Electricity Co. regarding failures of supply, and is also to ask the Electricity Commissioners to hold an inquiry. Councillor Bruce stated at the last meeting of the Council that drastic steps, rather than an inquiry, should be taken, and the matter should be raised in the House of Commons. The public of Inverness, he declared, were long-suffering in putting up with these failures. Several years ago the Council asked to be allowed to install new plant at its power-house, but was refused permission by the Electricity Commissioners, and eventually arranged with the Grampian Co. for a bulk supply.

Liverpool.—SUPPLY TO HOSTELS.—In connection with a supply of electricity by the Electric Power and Lighting Committee to certain factory hostels, arrangements have been made for the Committee to buy back the plant and cables at the end of the war.

London.—SCHOOL LIGHTING.—The London County Council is to install electric lighting in schools used by the fire brigade at a cost of £1,600.

NORTHMET CHARGES.—At a recent meeting of the Wembley Council a repl/ was received from the Board of Trade to the Council's communication regarding the charges of the Northmet Power Co. The Board pointed out that the prices of electricity, gas and water did not come within the scope of the Prices of Goods Act, 1939. The Northmet Co. had agreed to withhold the proposed increase, and the Board did not consider there were any grounds for future investigation of the matter so far as past action was concerned. Councillor C. Barton said he was astonished that a statutory company could be given protection of this kind and moved a resolution expressing concern that the services of statu ory companies should be outside the Prices of Goods Act. He also moved that the B.O.T. should be pressed to receive a deputation. The resolutions were carried without opposition.

Northumberland.—ELECTRIC HEATING IN SHELTERS.—The Civil Defence Committee of the County Council has been experimenting with electric heating in air-raid shelters. At one shelter an automatic heater, thermostatically controlled, has been installed at a cost of £28. The cost of running it, states the Committee, is uncertain, and negotiations are in hand with the North-Eastern Electric Supply Co., Ltd., for a definite tariff. The Regional Commissioner has expressed satisfaction with the arrangement, and after an agreement has been reached on charges, similar installations will be provided in other shelters.

TRANSPORT

Liverpool.—FIRE AT TRAM DEPOT.—A fire, which broke out at the Green Lane tram depot last week, damaged about 20 trams.

Switzerland.—BRUNIGBAHN ELECTRIFICATION.—During electrification of the Brunig metre-gauge line of the Swiss Federal Railways, connecting the two important tourist centres of Lucerne and Interlaken, the number of curves has been reduced so that the maximum train speed can be increased by 12 MPH. Electric traction was started on the Lucerne-Meiringen section in November, and electrification of the remainder is now in hand. Describing the line, *Modern Transport* states that it includes gradients up to one in eight, with rack sections between Giswil and Meiringen, and is particularly suitable for electrification. Electricity is supplied at 15 kV, 16⅔ cycles, by direct connection of the overhead equipment of the Brünig line with that of the Lucerne station of the main Gotthard line, as well as by a special feeder line from the Emmenbrücke substation of the Swiss Federal Railways. This feeder line comprises a cable section 11 miles long and a 16¾-mile open high-voltage line, mounted on the poles of the contact lines. The existing semaphore signals have been replaced to a large extent by colour-light signals.

An E.P.E.A. Protest

THE Northern Ireland Section of the Electrical Power Engineers' Association has been in communication with the Minister of Commerce pointing out that the appointment of a Controller of the Belfast electricity undertaking might be construed as a reflection upon the professional abilities of the staff of the undertaking. The Minister was asked to publish a short statement making it clear that this was not the case. He has replied that while he is unable to make such a statement the appointment was not intended to reflect in any way upon the professional abilities of the Belfast technical staff.

Electrical Travellers

OVER three hundred members and their friends attended the annual luncheon of the Electrical Trades Commercial Travellers' Association at the Connaught Rooms, London, last Friday. The chair was taken by Mr. J. D. Reddy. Proposing the toast of "The Association," in the absence through illness of Mr. E. E. Hoadley, Mr. F. Selley borough electrical engineer of St. Marylebone, thanked "technical travellers"—a better term, he thought, than "commercial travellers"—for the help they gave electricity supply engineers in complicated matters, and said that he believed that their services would more than ever be required after the war.

In response, Mr. T. H. Windibank, the president, after expressing appreciation of the energetic work of the committee, said that he was old enough to remember the days of the old-time commercial traveller who before the days of the motor-car had started a sales discipline which was of great service to the industry to-day. The electrical industry was only about sixty years old, but by means of intensified salesmanship the benefits of electricity had been made available throughout the world. In the seventeen years of its existence the Association had done a good job, but he believed that there would be much more for it to do after the war when he hoped that it would be able sitll further to enlarge its scope.

Appealing on behalf of the benevolent fund, Mr. S. Johnson, the secretary of the Association, mentioned that no application for help had ever been turned away, and in addition support had also been given to the Royal Commercial Travellers' Schools and the Electrical Industries Benevolent Institution, the contribution to which had been increased last year to 60 guineas. Other speakers were Messrs. C. F. Dickson, W. Harding and C. J. Elvy.

Wartime Supply in Eire

AT a recent meeting in Dublin Mr. R. F. Browne, chairman of the Electricity Supply Board of Eire, spoke on the subject of "Our Electrical Supplies," and gave some interesting details of the measures taken by the Board to meet wartime exigencies.

Strict economy, shorter shop hours and other things had had a marked effect upon consumption for general lighting in the past ten months, he said. From May last the sale of cookers and heaters at the Board's showrooms had been discontinued. He pointed out that during the period from April to September coal was relied upon to produce from one-half to five-sixths of the total energy generated. A very fine slack which could not be burned in household grates was used for the boiler plant at the Pigeon House power station, which was designed to burn anthracite.

Speaking of the Liffey Scheme, Mr. Browne said that despite considerable difficulty in procuring plant they were not without hope that temporary arrangements could be made to bring Poulaphouca station into limited commission in the course of this year. It must be borne in mind that the output of the Liffey development would only be about 30,000,000 kWh, a relatively small proportion of their present output of 450,000,000 kWh. Plans had been made for a turf generating station at Portarlington, but they could not proceed further until plant was obtainable. Such precautionary measures as had been taken were not wholly in the interests of revenue; at the present time the security of supply was much more important than temporary losses. He thought that the shortage of supplies would become increasingly severe, and that some measure of relief could be attempted only by the exercise of the greatest economy.

In moving a vote of thanks, Mr. P. L. M'Evoy said that recently the Minister of Finance had advanced £13,000,000 to the Electricity Supply Board, and this had been lent at about 5 per cent. If they had a loan floated at 3¾ per cent. it would mean a saving of £225,000 per annum. Mr. L. C. Blennerhassett, seconding, paid a warm tribute to the manner in which the E.S.B. was discharging its duties to the public.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, February 19th, 6 p.m. London. Paper: "The Electric Spark," by Mr. J. M. Meek, M.Eng. Monday, February 23rd, 6 p.m. Informal meeting. Discussion on "High-rupturing-capacity Fuses and Circuit-breakers," to be opened by Mr. A. R. Blandford.

West Wales (*Swansea*) *Sub-Centre.*—Saturday, February 14th, 3 p.m. Exchange Buildings, Swansea. Paper: "Outdoor Bushings for Transformers and Oil Circuit-breakers," by Mr. W. A. Cook, B.Sc. (Eng.).

Mersey and North Wales (*Liverpool*) *Centre.*—Monday, February 16th, 5.30 p.m. Liverpool Royal Institution, Colquitt Street. Paper as for West Wales. *Students' Section.* — Saturday, February 28th. Lecture by Dr. W. G. Radley.

Irish Centre.—Thursday, February 19th. Paper: "Small Water-Power Development," by Mr. J. W. Walker.

North-Western Centre.—Saturday, February 21st, 2.30 p.m. Engineers' Club, Manchester. Discussion on post-war planning to be opened by Messrs. B. A. G. Churcher, M.Sc., and J. W. Thomas, LL.B., B.Sc. (Tech.). *Students' Section.* —Saturday, February 14th, 2.30 p.m. Lecture: "Telecommunications of the Future," by Dr. W. G. Radley.

North-Eastern Centre.—Monday, February 23rd, 6.15 p.m. Neville Hall, Westgate Road, Newcastle-upon-Tyne. Paper: "City Distribution by Solid Low-voltage Networks," by Mr. B. Wood, M.A. *Students' Section.*—Saturday, February 21st. Pot-pie supper.

Association of Supervising Electrical Engineers.—Saturday, February 14th, 12.30 for 1 p.m. Connaught Rooms, London, W.C.2. Luncheon and reunion (tickets 9s. 6d. each). Saturday, February 21st, 2.30 p.m. Lighting Service Bureau, Savoy Hill, London, W.C.2. Lecture: "The Control of Electric Furnaces," by Mr. W. Fordham Cooper, M.I.E.E., Electrical Inspector of Factories.

Association of Mining Electrical and Mechanical Engineers.—South Wales Branch.—Saturday, February 14th, 5.30 p.m.. S.W. Institute of Engineers, Park Place, Cardiff. Paper: "Discharge Lighting in Mines,"by Mr. C. S. Chubb.

Institute of Fuel.—Monday, February 16th, 3 p.m. Sheffield Public Libraries Lecture Hall. Discussion on means of improving efficient use of fuel to be opened by Dr. R. J. Sarjant, Mr. H. C. Armstrong and Mr. D. Wilson.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

R. **A. Lister & Co., Ltd.,** report a trading profit for the year to September 30th of £131,517, as compared with £139,293 in the preceding year. After deducting directors' fees, pensions contributions, etc., commissions and staff bonus, the net profit is £90,280 (against £99,577). The final ordinary dividend is 5 per cent., plus a bonus of 6 per cent., maintaining the distribution for the year at 16 per cent., an additional sum of £10,000 is placed to pensions reserve, general reserve receives £15,000, and £70,468 is carried forward (against £70,863 brought in).

The **Yorkshire Electric Power Co.,** in its report for 1941, states that under the Defence Regulations it is prohibited from publishing its accounts. It is proposed to maintain the ordinary dividend for the year at 8 per cent. The business has continued to make satisfactory progress, and proper provision has been made for depreciation, obsolescence and wartime needs.

R. **B. Pullin & Co., Ltd.,** report a trading profit for the year ended October 31st of £99,240, as compared with £91,493 for 1939–40, which with other income of £633 makes £99,873. After charging directors' fees and depreciation, and providing £62,413 for income tax, N.D.C. and E.P.T., the net profit is £29,551 (against £25,580). The final dividend is 15 per cent., maintaining the distribution for the year at 20 per cent., less tax, general reserve receives £10,000 and £1,327 is carried forward (against £1,776 brought in).

The **Shawinigan Water & Power Co.** states that, owing to a further marked gain in primary power output, the gross revenue for 1941 reached a record of $20,064,283, as compared with $17,064,714 for 1940. The net profit was $2,320,263 (against $2,064,942), equal to $1·06 (95 cents) per share. Dividends (paid quarterly) were maintained at 90 cents per share for the year, leaving a surplus of $359,838 (against $104,517).

The **English Electric Co., Ltd.,** in a preliminary statement, reports a profit for 1941 of £362,604, as compared with £363,736 for 1940. In each case the figure is struck after providing for taxation. The ordinary dividend for the year is being maintained at 10 per cent.

The **Electrical & Industrial Investment Co.** reports an income for 1941 of £51,747, as compared with £52,584 for the previous year, and after deducting directors' fees, expenses, interest and income tax, a net revenue of £33,207 (against £36,237). The dividend on the deferred ordinary stock is again 12 per cent., and the balance carried forward is £63,961 (against £55,753 brought in).

The **Power Securities Corporation, Ltd.,** reports a net profit for 1941, after providing for taxation, of £52,035, as compared with £48,974 in 1940. The ordinary dividend for the year is maintained at 6 per cent.

Redfern's Rubber Works, Ltd., reports a profit of £45,834 for 1941 (against £41,687). The dividend is reduced from 12 to 10 per cent. Record sales were made during the year.

New Companies

Greenwood Engineering Co., Ltd.—Private company. Registered January 29th. Capital, £2,000. Objects: To carry on the business of electrical, mechanical, constructional, motor, marine, radio, telephonic and telegraphic engineers, wire workers, metal founders, refiners and workers, etc. Directors: S. H. Highfield, 51, Bishopsthorpe Road, London, S.E.26, C. H. Short, 2, Kenton Park Close, Kenton, Middlesex, and W. G. Napper, 38, Sherwood Avenue, Greenford. Registered office: 25, Garlick Hill, E.C.4.

Coventry Diesel Engines, Ltd.—Private company. Registered January 28th. Capital, £1,000. Objects: To carry on the business of manufacturers of internal-combustion engines, motor-cars, parts and accessories, electric motors, generating sets, etc. Subscribers: E. Rudland and E. Sanders, both of 97, Cannon Street, E.C.4. Solicitors: Linklaters & Paines, Granite House, 97, Cannon Street, E.C.4.

S. Trauberman, Ltd.—Private company.—Registered January 28th. Capital, £3,000. Objects: To carry on the business of importers and exporters of and wholesale dealers in goods and merchandise of all kinds, importers and exporters of and dealers in dynamos, motors, armatures, accumulators, acids, batteries, insulators, rubber, bakelite articles, electrical plant, appliances and supplies, etc. Directors: S. Trauberman, 66A, Goodge Street, W.1, and L. Garfunkel, 66A, Goodge Street, W.1. Solicitors, Herbert Oppenheimer & Co., Donington House, Norfolk Street, W.C.2.

Northern Sheet Metal Works, Ltd.—Private company. Registered January 29th. Capital, £500 in 500 shares of £1 each. Objects: To carry on the business of metal workers, heating, ventilating, electrical and air-conditioning engineers, etc. Directors: S. Ainsley and E. Ainsley, both of 68, Fieldhead Avenue, Bury. Registered office: Lloyds Bank Chambers, Bolton Street, Bury, Lancs.

McDermott (Engineers), Ltd.—Private company. Registered January 29th. Capital, £200. Objects: To carry on the business of manufacturers of, dealers in and agents for boilers, turbines, winding engines, haulage plant, dynamos, motors, electrical and air compressing plant and equipment, pumps, coal cutters, conveyors, elevators, etc. Directors: P. J. McDermott, Thorncliffe, Buxton Road, Great Moor, Stockport, Cheshire, F. Wheatcroft, 20, Leegate Road, Heaton Moor, Stockport, Cheshire, and R. W. Stafford, Scawthorpe House, Doncaster. Registered office: 3, Parsonage, Manchester.

Companies' Returns

Statements of Capital

Bournemouth & Poole Electricity Supply Co., Ltd.—Capital, £1,300,000 in 75,000 4½ per cent. cumulative preference and 325,000 6 per cent. cumulative preference shares of £1 each, £745,769 ordinary stock and 154,231 ordinary shares of £1. Return dated April 8th (filed September 12th).

75,000 4½ per cent. preference and 190,250 6 per cent. preference shares and £745,769 ordinary stock issued. £550,000 paid on 75,000 4½ per cent. preference and 175,000 6 per cent. preference shares and £300,000 ordinary stock. £461,019 considered as paid on £15,250 6 per cent. preference shares and £445,769 ordinary stock. Mortgages and charges: £400,000.

L. W. Douthwaite & Co., Ltd.—Capital, £7,000 in £1 shares. Return dated August 30th (filed October 17th). 5,519 shares taken up. £1,321 paid. £4,198 considered as paid. Mortgages and charges: £1,303.

George Hill & Co., Ltd.—Capital, £4,000 in £1 shares. Return dated May 1st. 2,150 shares taken up. £2,150 considered as paid. Mortgages and charges: Nil.

Leach Electrical & Engineering Co., Ltd.—Capital, £1,500 in 500 preference and 1,000 ordinary shares of £1 each. Return dated August 30th, 1940 (filed October 13th, 1941). 500 preference and 500 ordinary shares taken up. £502 paid on 500 preference and 2 ordinary shares. £498 considered as paid. Mortgages and charges: £1,800.

Park Bros., Ltd.—Capital, £11,000 in 4,000 ordinary, 3,000 7½ per cent. preference and 4,000 6 per cent. preference shares of £1 each. Return dated December 8th. 2,935 ordinary, 3,000 7½ per cent. preference and 3,445 6 per cent. preference shares taken up. £9,114 10s. paid (5s. on 354 ordinary and £1 on the remainder). Mortgages and charges: £650.

Electroflo Meters Co., Ltd.—Capital, £21,000 in 10s. shares. Return dated July 23rd. All shares taken up. £11,000 paid on 22,000 shares. £10,000 considered as paid on 20,000 shares. Mortgages and charges: Nil.

North Cheshire Electric Co., Ltd.—Capital, £500 in £1 shares. Return dated July 31st. 450 shares taken up. £250 paid. £200 considered as paid. Mortgages and charges: Nil.

Invincible Electrical Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated July 31st (filed August 16th). 400 shares taken up. £400 paid. Mortgages and charges: Nil.

Express Cable Engineering Co., Ltd.—Capital, £300. Return dated September 22nd. 142 shares taken up. £142 paid. Mortgages and charges: Nil

Birmingham Electric Furnaces, Ltd.—Capital, £1,000 in £1 shares. Return dated September 16th. 1,000 shares taken up. £1,000 paid. Mortgages and charges: Nil.

Helios Electrical Co., Ltd.—Capital, £200 in 200 shares of £1 each. Return dated December 31st. 60 shares taken up. £60 paid. Mortgages and charges: Nil.

Falconar Cross & Co., Ltd.—Capital, £7,000 in 3,500 preference and 3,500 ordinary shares of £1. Return dated October 28th. 3,300 preference and 2,002 ordinary shares taken up. £2 paid. £5,300 considered as paid. Mortgages and charges: £4,237 2s. 4d.

Companies to be Struck off Register

The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary:—Brooklyn Electrical Development Co., Ltd.; Electric Steels, Ltd.; Electronic Rangefinders, Ltd.; Great West Radio Service, Ltd.; and Radiometrics (Nottingham), Ltd.

Increases of Capital

P. X. Fox, Ltd.—The nominal capital has been increased by the addition of £1,500 beyond the registered capital of £500. The additional capital is divided into 6,000 ordinary shares of 5s. each.

C. & R. Research, Ltd.—The nominal capital has been increased by the addition of £25 beyond the registered capital of £6,025. The additional capital is divided into 500 ordinary 1s. shares.

Mortgages and Charges

Edison Swan Electric Co., Ltd.—Satisfaction in full on December 30th, 1941, of mortgage dated August 24th, 1921, and registered August 25th, 1921, securing all moneys due or to become due from the company to Coutts & Co.

North-Eastern Electric Supply Co., Ltd.—Satisfaction (a) to the further extent of £27,540 on December 22nd, 1941, of £1,500,000 3½ per cent. consolidated debenture stock secured by trust deed dated August 1st, 1935, and registered August 13th, 1935; and (b) to the further extent of £61,668 on December 22nd, 1941, of £2,500,000 3½ per cent. consolidated debenture stock secured by trust deed dated December 30th, 1933, and registered January 17th, 1934.

Electrical Trading Association, Ltd.—Supplemental deed of covenant and guarantee dated January 17th, 1942, to secure sums in excess of the normal lending limit of the chargees advanced on mortgage to purchasers of houses on the estates of the Preston Park Estate (Wembley), Ltd., since June 30th, 1937, and future advances. Property charged: Moneys standing to the credit of deposit accounts in the name of the company with the chargees (Cheltenham and Gloucester Building Society).

Underwood (Electric), Ltd.—Assignment of proceeds of various contracts, dated January 14th, 1942, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £1,700.

J. G. Smithson & Co., Ltd.—Two mortgages on proceeds of certain contracts, dated January 14th and 17th, 1942, to secure all moneys due or to become due from the company to Lloyds Bank, Ltd., not exceeding £110 and £150 respectively.

Winding-up Petition

Whitehead Switchgear & Inventions Ltd.—A petition for the winding-up of this company has been presented to the High Court by Aberdare Cables, Ltd., and will be heard in London on February 16th.

Liquidations

Page & Miles, Ltd.—Particulars of claims by March 3rd, to the liquidator, Mr. N. W. Osborne, 11–12, Finsbury Square, London, E.C.2.

Leda Electric, Ltd.—Meeting March 6th at 42, Spring Gardens, Manchester, to receive an account of the winding-up by the liquidator, Mr. J. Blakey.

Bankruptcies

L. R. Williams, electrical contractor, 1A, Angel Street, Bridgend.—First meeting February 10th at 10, St. Mary's Square, Swansea. Public examination February 19th at the County Court, Wyndham Street, Bridgend.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK Exchange business is proceeding at a humdrum pace. The volume of daily bargains shows a tendency to contract owing, of course, to the continued seriousness of the news from the Far East. While the fate of Singapore hangs in the balance, neither investment nor speculation show signs of activity. Cable and Wireless ordinary stock has been a dull market on fears lest the position in the Far East may have an unfavourable effect upon the company's traffics. Shares in the manufacturing and equipment group are generally strong. Declaration of the usual 10 per cent. dividend by the English Electric Co. fulfilled previous expectation.

An Electrical Conversion

The decision of the North-Eastern Electric Supply Co. to pay off the whole of its £2,200,000 five per cent. consolidated debenture stock on May 1st next at 102 per cent., is in line with the general tendency of money conditions at the present time. The holders are given the choice of having their stock paid off at 102 in cash, or of converting it at the same rate into the company's 3¾ per cent. consolidated debenture stock, redeemable on or before May 1st, 1980. The repayment price of the old stock and the issue price of the new being the same, the holder of £100 of the former will receive £100 of the latter if he decides to convert. It may be assumed that a large proportion of the present stock will be exchanged into the new security by the holders.

Electrical Finance

Repayment or conversion of the North-Eastern Electric 5 per cent. debenture stock had no influence over the quotations of other securities. There is a 5½ per cent. debenture stock of the Electrical Finance & Securities Co., Ltd. At present £292,894 of the stock is outstanding. The company has the right to repay at 100 in whole, or in part, at any time after 1940, upon giving six months' notice. The full term of the issue is December 31st, 1963. The stock last marked 99¾. The company has made no announcement yet as to repayment or conversion of the 5½ per cent. debenture stock, but it would not be astonishing if the company were to follow the example of the North-Eastern Electric and repay the outstanding stock, or offer to convert it into another security giving a lower rate of interest.

Home Electricity Supply

Nobody can possibly quarrel with the assertion that shares in the Home electricity supply companies rank amongst the highest-class securities of their kind. The modest yields which the shares offer at current prices and on the basis of the last-paid dividends, are sufficient evidence—if evidence be required—of the confidence with which capital regards the shares. The only thing which is likely to disturb the quotations and the satisfaction of shareholders is renewal of damage from the air. When the London raids were in full blast, prices of Home electricity supply shares were noticeably unsettled. Holders did get a little nervous about their companies; shares did come to market to a moderate extent. Upon the suspension of the raids, followed as this was by the War Damage Bill promoted by the Government, prices easily recovered their previous declines. Since then, they have been mounting steadily.

Investment Confidence

Were there to be any recurrence of the enemy's aerial activity, it might have the effect of inducing, also, recurrence of apprehension in the minds of shareholders. But such possibility deserves no more than a passing reference. It is present, Stock Exchange brokers know, in the minds of holders of electricity supply shares. Investors, however, may feel satisfied on the point that, if a large scale campaign were started by the enemy, the effect upon the market for electricity supply shares would be merely temporary as before.

Equipment and Manufacturing

The concrete case was quoted here last week of 10,000 Callender's shares changing hands without their finding any difficulty in securing a permanent home, and, moreover, without the transaction having any unfavourable effect upon the price. This remains at 73s. 9d. The pressure to accumulate shares of this nature is again strikingly brought out by improvements that have occurred in the prices of British Insulated, Ericsson Telephones, General Electric ordinary, Greenwood & Batley, Johnson & Phillips and Reyrolle, the prices of all of which are in each case ⅛ up. Associated Electrical Industries have risen a similar fraction to 46s. 3d. Allen West at 5s. 9d. show a gain of the pence, and Hopkinson's at 47s. are also 9d. higher. Ever Readys strengthened to 31s. Lucas are firmer at 68s. 9d. and Hall Telephones have advanced to 17s. Ward & Goldstone at 18s. are 1s. 6d. up.

Miscellaneous Movements

Nor is the pressure to buy shares confined to the ordinary issues. On nearly every business day the prices of several preferences are marked up, without, however, serving to bring in shares from the present holders. There is very little debenture stock obtainable and it should be mentioned in connection with the ordinary shares, that the fact that a quotation stands at a certain figure does

(*Concluded on page* 223)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Feb. 9	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	15	12½	55/-	..	4 11 0
British Power and Light	7	6	27/-	..	4 10 7
City of London	7½	7	27/-	..	5 3 9
Clyde Valley	8	8	38/9	+6d.	4 2 0
County of London	10½	8	38/3	+9d.	4 3 4
Edmundson's:					
7% Pref.	7	7	33/3	..	4 4 4
Ord.	6	6	28/6	..	4 4 3
Elec. Dis. Yorkshire	9	9	42/-	..	4 5 9
Elec. Fin. and Securities	12½	12½	45/-	+⅛	5 11 2
Elec. Supply Corporation	11½	10	45/-	..	4 9 0
Isle of Thanet	2	Nil	9/-	..	—
Lancs Light and Power	7½	7½	34/6	..	4 7 0
Llanelly Elec.	5½	5½	22/-	..	5 0 0
Lond. Assoc. Electric	5½	4½	19/6	..	4 12 4
London Electric	7	7	24/6	..	5 14 3
London Power Deb. Red.	5	5	105	..	4 15 3
Metropolitan	10	8	37/-	..	4 6 6
Midland Counties	8	8	38/9	..	4 2 0
Mid. Elec. Power	9	9	41/3	..	4 7 4
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec.:					
Ordinary	7	7	30/9	+9d.	4 11 1
7% Pref.	7	7	34/-	..	4 2 4
Northampton	10	10	45/9	+⅛	4 7 4
Notting Hill 6% Pref. (£10)	6	6	8½	..	—
Northmet Power:					
Ordinary	10	7	35/-	..	4 0 0
6% Pref.	6	6	31/-	+6d.	3 17 5
Richmond Elec.	6	6	23/9	..	5 1 1
Scottish Power	8	8	38/9	..	4 2 9
Southern Areas	5	5	19/6	..	5 2 8
South London	7	7	25/-	..	5 12 0
West Devon	5	5	21/3	..	4 14 1
West Glos.	4½	4½	21/3	+⅛	4 4 8
Yorkshire Elec.	8	8	39/6xd	..	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/9	−3d	—
Calcutta Elec.	8*	7*	31/3	−2/3	—
Cawnpore Elec.	10	10	30/-	..	6 12 4
East African Power	7	7	27/-	..	5 3 8
Jerusalem Elec.	7	5	18/9	..	5 6 8
Kalgoorlie (10/-)	7½	7½	10/6	..	7 2 10
Madras Elec.	6*	4*	22/6	..	3 11 1
Montreal Power	1½	1½	25	−½	6 0 0
Palestine Elec. "A"	Nil	Nil	20/9	..	—
Perak Hydro-elec.	6	7	7/6	..	18 13 4
Shawinigan Power	83cts.	90cts.	15½	..	—
Tokyo Elec. 6%	6	6	12½	..	—
Victoria Falls Power	15	15	77/6	−½	3 17 4
Whitehall Inv. Pref.	7½	7½	15/-	..	10 0 0

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Feb. 9	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1950-70	5	5	110xd	..	4 11 1
1955-75	5	5	115	..	4 7 0
1951-73	4½	4½	108	..	4 3 4
1963-93	3½	3½	103	..	3 8 0
1974-94	3½	3½	99	..	3 5 8
London Elec. Trans. Ltd.	2½	2½	95	..	2 12 10
London & Home Counties 1955-75	4½	4½	109	..	4 2 7
Lond. Pass. Trans.:					
A	4½	4½	119½	..	3 15 4
B	5	5	119½	..	4 3 8
C	1½	3	40	..	7 10 0
West Midlands J.E.A. 1948-68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	108½	+1	5 10 8
Def.	1½	1½	25½	+1	5 17 8
Anglo-Portuguese	8	8	16/3	+⅛	9 17 0
Cable & Wireless:					
5½ Pref.	5½	5½	106½	+1	5 3 4
Ord.	4	4	68½	−1	5 16 10
Canadian Marconi $1	Nil	4cts.	6/-	..	2 10 6
Globe Tel. & Tel.:					
Ord.	8½*	8½*	30/-	..	—
Pref.	6	6	28/9	..	4 3 4
Great Northern Tel.: (£10)	20	20	14½	..	—
Inter Tel. & Tel.	Nil	Nil	3	..	—
Marconi-Marine	7½	7½	28/9	..	5 4 4
Oriental Tel. Ord.	11½*	16	57/6	−½	5 11 4
Telephone Props.	6	6	10/-	..	12 0 0
Tele. Rentals (5/-)	10	10	9/-	..	5 11 1
Traction and Transport					
Anglo. Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/-	..	—
4% Inc.	Nil	Nil	8½	..	—
Brit. Elec. Traction:					
Def. Ord.	45	45	935	..	4 16 9
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8*	8	43/9	..	3 13 1
Brazil Traction	$1	50c.	14	..	—
Calcutta Trams	8	5½	20/-	..	5 10 0
Cape Elec. Trams	5	5	18/6	..	5 8 3
Lancs Transport	10	10	45/-	..	4 9 0
Mexican Light:					
1st Bonds	5	5	75	−5	6 13 4
Rio 5% Bonds	5	5	93½	..	5 7 0
Southern Rly.:					
5% Prefd.	5	5	64½	..	7 15 0
5% Pref.	5	5	107½	..	4 13 0
T. Tilling	10	10	48/3	+9d.	4 3 2
Tilling & B.A.	7*	6½*	52/6	..	2 9 6
West Riding	10	10	39/6	..	5 1 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Feb. 9	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord. ..	Nil	7½	23/–	..	6 10 4
Assoc. Elec:					
Ord.	10	10	46/3	+⅛	4 6 9
Pref.	8	8	38/9	..	4 2 4
Automatic Tel. & El.	12½	12½	48/9	..	5 2 6
Babcock & Wilcox	11	11	45/–	–9d.	4 17 9
British Aluminium	12½	10	45/9	..	4 7 4
British Insul. Ord.	20	20	92/6	+⅛	4 6 9
British Thermostat (5/–)	18½	18½	13/9	..	6 14 6
British Vac. Cleaner (5/–)	12½	10	11/3	..	4 9 0
Brush Ord. ..	Nil	Nil	4/6	..	—
Callender's ..	15	15	73/9	..	4 1 4
Chloride Elec. Storage	15	15	72/6	+⅛	4 2 9
Consolidated Signal	17	17	77/6	..	4 7 8
Crabtree (10/–) ..	17½	17½	29/6	+⅛	5 18 8
Crompton Parkinson Ord. (5/–) ..	30	20	22/6	..	4 9 0
E. K. Cole (5/–) ..	Nil	7	9/6	..	3 13 9
E.M.I. (10/–) ..	Nil	6	14/3	..	4 4 3
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord.	16½	12½	55/–	..	4 11 0
Elecl. Switchgear (10/–)	16	10	20/–	..	5 0 0
English Electric ..	10	10	40/–	..	5 0 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)..	25*	22*	41/3	+⅛	2 13 3
Ever Ready (5/–) ..	40	40	31/–	+6d.	6 9 0
Falk Stadelmann ..	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C.:					
Pref.	6½	6½	33/9	..	3 17 2
Ord.	20	17½	82/6	+⅛	4 5 6
Greenwood & Batley	15	13	27/6	+⅛	9 9 0
Hall Telephone(10/-)	15	10	17/–	+⅛	5 17 8
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	21/3	..	4 4 8
Hopkinsons ..	15	15	47/–	+9d.	6 7 10
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion ..	32½	30	107/6	..	5 11 6
J. Lucas	15	15	68/9	+⅛	4 7 3
Johnson & Phillips	15	15	58/9	+⅛	5 2 0
Lancashire Dynamo	20	20	66/3	..	6 0 10
Laurence, Scott (5/-)	15	15	11/–	..	6 16 4
London Elec. Wire	7½	7½	25/–	..	6 0 0
Mather & Platt ..	13½	10	42/6	..	4 14 1
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	97/6	..	4 2 0
Pye Deferred (5/-)..	25	25	15/–	..	8 6 8
Revo (10/–) ..	5	20	25/7½	..	7 16 0
Reyrolle	12½	12½	57/6	+⅛	4 7 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Strand Elec. (5/-) ..	2	4	3/6	..	5 14 4
S. Smith (1/–) ..	50	37½	7/–	..	5 7 2
Switchgear & Cowans (5/–) ..	10	15	10/–	..	7 10 0
Tel. Condenser (10/-)	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	41/3	..	4 17 0
Telephone Mfg. (5/-)	9	9	9/–	..	5 0 0
Tube Investments..	23¾	20	85/9	..	4 13 3
Vactric (5/–) ..	4	Nil	4/–	+6d.	—
Vickers (10/–) ..	10	10	16/9	–6d.	5 19 5
Ward & Goldstone (5/–)	20	20	18/–	+1/6	5 11 1
Westinghouse Brake	17½	10	50/–	..	4 0 0
Walsall Conduits(4/-)	55	55	32/6	..	6 15 4
West, Allen (5/–) ..	7½	7½	5/9	+9d.	6 10 5

* Dividends are paid free of Income Tax.

Stocks and Shares (*Concluded from page* 221)

not mean that the would-be purchaser is sure to find shares on offer at anything like that level.

While Cable & Wireless ordinary stock has receded a point to 68½, the 5½ per cent. preference stock is similarly better at 106½, the rise in the latter being due to the insistent investment demand for stocks of this nature. Oriental Telephone shares have fallen a further 2s. 6d. to 57s. 6d. Anglo-Portuguese Telephones hardened to 16s. 3d. on consideration of the handsome yield offered by these shares at their present price on the basis of 8 per cent. dividend.

Brazilian bonds of all kinds are in pronounced favour. Rio fives at 93½ have gained a point. On the other hand, the recent rapid rise in Mexicans has come to something like a halt. Mexican Light & Power first mortgage bonds at 75 yielded the 5 points gained a week ago. Amongst electricity supply shares, Northamptons are better at 45s. 9d. West Gloucesters at 21s. 3d., showing a gain of ⅛, come into line with West Devon Electrics. Indian shares are still disposed to dullness; Calcutta Electrics at 31s. 3d. are 2s. 3d. down. No recovery has occurred in Perak Hydro-Electrics.

Victoria Falls

Victoria Falls & Transvaal Power ordinary stock further receded 2s. 6d. to 77s. 6d., in spite of cables which showed the previous reports about sabotage on the company's property to have been grossly exaggerated. These spoke of severe damage having been inflicted upon the system of supply to the principal mines, but the official statement announced that no attempts had been made to wreck any main power stations, though transmission towers were blown up by saboteurs, causing temporary dislocation of mine work. No serious casualties occurred and normal working was quickly re-established. The shares were standing at 81s. 3d. prior to the outrage being reported. It is doubtful whether any considerable number of shares came into the market, the price having been marked down more as a precautionary measure than as the result of any real pressure on the part of holders to get out of their investment.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1940

114. "Automatic feed-water regulator for steam boilers." Ansaldo Soc. Anon. January 23rd, 1939. (542590.)

6081. "Portable lamps having clockwork generators." F. Carello, P. Magliola and M. Magliola (trading as Fausto Carello & Cia. Succ. Fausto e Pietro Carello Fratelli). May 4th, 1939. (542555.)

9434. "Electric motor speed-control systems." E. L. N. Towle and Metropolitan-Vickers Electrical Co., Ltd. May 29th, 1940. (542604.)

9716. "Fuse-provided electrical devices." L. G. Morten and J. F. O'Brien. June 7th, 1939. (542525.)

10115. "Current rectifiers." Akt-Ges. Brown, Boveri & Cie. June 8th, 1939. (542558.)

11451. "Band-spread tuning circuits for radio receivers." Mullard Radio Valve Co., Ltd., F. Caplin and C. E. Payne. July 9th, 1940. (Cognate application 2231/41.) (542611.)

11482. "Furnaces for the melting or other heat treatment of metals and the like." Electric Furnace Co., Ltd., and J. R. Spanswick. July 10th, 1940. (542598.)

11632. "Thermionic amplifiers." Standard Telephones & Cables, Ltd., B. B. Jacobsen, and A. H. Roche. July 12th, 1940. (542510.)

11758. "Photo-electric cells." G. A. Veszi. July 16th, 1940. (542599.)

11796. "High-speed reclosing mechanism for electric circuit-breakers." British Thomson-Houston Co., Ltd. July 18th, 1939. (542583.)

11820. "Radio direction-finding apparatus." Marconi's Wireless Telegraph Co., Ltd., and J. H. Moon. July 17th, 1940. (542584.)

11849. "High-speed circuit-breaker reclosing mechanisms." British Thomson-Houston Co., Ltd. July 18th, 1939. (Addition to 526422.) (542585.)

11863. "Centrifugal separators." Babcock & Wilcox, Ltd. August 12th, 1939. (542610.)

11976. "Variable inductance devices." Marconi's Wireless Telegraph Co., Ltd. July 20th, 1939. (542531.)

12010. "Elevator safety governors." Westinghouse Electric International Co. July 25th, 1939. (542532.)

12304. "Cooling of dynamometers and like machines with swinging frames." English Electric Co., Ltd., and A. S. Fenemore. July 29th. 1940. (542512.)

12332. "Synthetic resinous compositions." British Thomson-Houston Co., Ltd. August 2nd, 1939. (542513.)

12559. "Phase-shifting networks applied to directive antenna systems." Standard Telephones & Cables, Ltd. August 3rd, 1939. (542535.)

13638. "Regulating systems for grid-controlled rectifiers." Westinghouse Electric International Co. September 7th, 1939. (542562.)

14049. "Construction of dynamo-electric apparatus." J. Lucas, Ltd., and E. A. Watson. September 10th, 1940. (542539.)

14588. "Line drop compensators." British Thomson-Houston Co., Ltd. September 26th, 1939. (542563.)

14965. "Optical-projection apparatus wherein the source is a h.p., m.v. electric-discharge lamp." General Electric Co., Ltd., and H. W. B. Gardiner. October 7th, 1940. (Cognate application, 6041/41.) (542541.)

15212. "Electric radiators." G. J. Berry. October 14th, 1940. (542542.)

15217. "Removal of binders from surface coatings of luminescent or other powdered materials." British Thomson-Houston Co., Ltd., and J. T. Anderson. October 14th, 1940. (542517.)

15491. "High-pressure mercury-vapour lamps." British Thomson-Houston Co., Ltd., and H. K. Bourne. October 21st, 1940. (542544.)

15655. "Indicating device particularly for radio direction-finding apparatus." Standard Telephones & Cables, Ltd. October 25th, 1939. (542564.)

15993. "Automatic telephone and like selective systems." Siemens Bros. & Co., Ltd., D. A. Christian and D. L. Clay. November 1st, 1940. (542546.)

16790. "Gas-blast circuit-breakers." Maschinenfabrik Oerlikon. November 1st, 1939. (542601.)

17726. "Current supply arrangements for electric sound-recording machines." Dictaphone Corporation. December 21st, 1939. (542548.)

1941

269. "Operating mechanisms for electric circuit-breakers." British Thomson-Houston Co., Ltd. January 8th, 1940. (542569.)

1193. "Fluid-pressure operated electric circuit-breakers." British Thomson-Houston Co., Ltd. January 30th, 1940. (542602.)

13004. "Means for saving life." General Electric Co., Ltd., G. Ellis and C. W. Saunders. April 3rd, 1940. (Divided out of 539751.) (542553.)

Amended Specifications

528310. "Thermionic valve circuits." A. D. Blumlein.

532142. "X-ray inspection apparatus." British Thomson-Houston Co., Ltd.

537918. "Ultra-high-frequency oscillators." Marconi's Wireless Telegraph Co., Ltd.

538214. "Successive indication of a plurality of conditions." Marconi's Wireless Telegraph Co., Ltd.

Lift Cables

FOLLOWING tests carried out with particular regard for fire resistance, flexible cables for both power and control circuits of electric lifts have been specified (B.S.977) without waiting for the lift specification itself which was in preparation at the outbreak of war. Conductors must be made in accordance with B.S.7, but the fresh specification includes special requirements with regard to their insulation, tapering, finish and testing, particularly in respect of the fire hazard. Copies of B.S.977, price 2s. 3d. post free, can be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—NEW SOUTH WALES.—March 19th. Sydney County Council Electricity Department. Motor-driven vacuum cleaning plant, fixed type, for Bunnerong power station. Specification 570.

Birkenhead. — February 16th. Electricity Department. Power transformers and electric lamps. (January 30th.)

Kettering.—March 2nd. Electricity Department. Switchboard extensions, 4,000-kVA transformer, etc. (February 6th.)

Newcastle-on-Tyne.—City Council. Renewal of the electric lighting installation at the administrative block at Shotley Bridge Hospital. Plans by J. F. C. Solomon, city estate and property surveyor.

Plymouth.—February 14th. Electricity Supply Department. Condenser circulating water screen. (January 30th.)

South Africa.—POST OFFICE DEPARTMENT.—March 26th. Automatic exchange equipment for Cambridge, East London. P.O. Tender 16.

Tottenham.—February 13th. Borough Council. Electric lamps. Schedule No. 20. Forms of tender from E. Townson, town clerk, Town Hall, London, N.15.

Orders Placed

Barrow-in-Furness. — Electricity Committee. Accepted. Cables in connection with switchhouse (£2,234).—B. I. Cables, Ltd.

Birmingham.—Electricity Committee. Accepted during the period from September 19th to January 16th: Supply, delivery and erection of an air compressor, etc.—Worthington-Simpson, Ltd. Supply, erection, testing, etc., of four boiler units and addition feed water and blowdown piping and valves.—International Combustion, Ltd.

Glasgow.—Corporation Transport Committee. Accepted. Cables, emergency stock (£10,184).—Scottish Cables, Ltd. Asbestos covered wire.—London Electric Wire Co. and Smiths, Ltd.; E. and E. Kaye, Ltd. Scrubbing machine for Larkfield canteen.—G.E.C.

Liverpool.—Electric Power & Lighting Committee. Accepted. 1,000-A polyphase meter testing set, complete with ammeters, voltmeters, power-factor meters and three sub-standard wattmeters (£1,315).—Metropolitan-Vickers Electrical Co., Ltd.

Sheffield.—Electricity Committee. Accepted. Condenser tubes for Neepsend power station (£2,443).—Yorkshire Copper Works, Ltd.

Smethwick.—Emergency Committee. Accepted. Wiring (£366) and services (£396) at 40 surface shelters.—S.W. & S. Electric Power Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Altrincham.—British Restaurants and cooking depot; E. M. Slater, borough surveyor, Town Hall.

Bangor.—Church, Maes Geirchen estate; Ivor Davies, architect, Yorkshire Chambers, 55, High Street.

Barnet.—School canteen (£1,250), off Wentworth Road, for Herts C.C.; Clerk's Department, Castle Street, Hertford.

Barnsley.—Cubicles at Kendray Hospital (£2,200) and central kitchen at Instruction Centre, Racecommon Road (£3,467); H. Taylor, borough surveyor, Town Hall.

Barrow-in-Furness.—Canteen, Vickerstown Park; Y.M.C.A.

Belfast.—Five potato drying factories; secretary, Ministry of Finance, Room 106, May Street, Belfast.

Blackburn.—Extension of Montague Street central kitchen, and cooking depot at Shakespeare Hotel, Bank Top; W. Pickstone, borough engineer, Town Hall.
Canteen; Foster, Yates & Thom, Canal Foundry.

Blackpool.—Four nurseries and cooking depot; borough engineer.

Bolton.—Canteen, Denvale Mill, Union Road; Combined Egyptian Mills, Ltd.

Brighouse.—Canteen; T. F. Firth & Sons, carpet and fabric manufacturers, Clifton Mills.

Caterham.—Cleansing station, Warlingham; U.D.C. surveyor.

Cheltenham.—Canteen and offices; Dowty Developments, Ltd.

Chertsey.—Kitchen and adaptation of building for canteen, Fordwater Road; W. V. Davies, engineer, Council offices, Chertsey.

Chorlton - on - Medlock.—Works and stores; Donald MacDonald, Ltd., building contractors, Trafford Bar, Manchester.

Clydebank.—Concrete houses; burgh surveyor.

Coalpool.—Church; Rev. R. W. Wardle, The Vicarage, Blakenhall, Staffs.

Coventry.—Offices; Economic Transport Co., Ltd.
Offices; J. Roach, Foleshill Road.

Cumberland.—Canteens at Keswick, Flimby, Longtown, Alston, Maryport, Grasslot, Dearham Ellenborough, Broughton Moor, Seaton, Cockermouth, Moor Row, and Bowness-on-Solway; county architect, 4, Alfred Street North, Carlisle.

Darfield.—Church, Great Houghton; Rev. H. Drown, All Saints' Rectory, Darfield, near Barnsley.

Derbyshire.—Alterations to Ashford War Memorial Institute for reception and feeding centre and to school for rest centre and sick bay; J. Harrison, county architect, County Offices, Derby.

Eccles.—Alterations to fire station; T. Elce, borough engineer, Town Hall.

Evesham.—British Restaurant (£2,214); J. Abbott, borough surveyor, Municipal Offices, High Street.

Felling-on-Tyne.—Rebuilding shop and bakery, High Street; Emerson Lowes, High Street.

Gateshead.—Additions to Bensham Hospital (£2,000); F. H. Patterson, borough engineer.

Glasgow.—Shops at Penilee (£7,350); city architect.

Reconstruction of St. Luke's School; architect, Education Department, Bath Street, Glasgow.

Gorton.—Additions, A. Hodkinson, Ltd., building contractors, 62, Greenhill Street, Manchester, 15.

Hendon.—War-time nursery, site near Montrose Avenue, and British Restaurant at Cricklewood; borough engineer, Town Hall, Hendon, N.W.4.

Keighley.—Canteen; Dean, Smith & Grace, Ltd.

Canteen; W. Slingsby & Co.

Lancashire.—Laundry equipment at Ormskirk and Clitheroe Institutions (£1,750) and alterations to Hospitals and Institutions with new equipment (£5,835); A. Evans, county architect, County Offices, Preston.

Lisburn (Northern Ireland).—Report centre at Castle Gardens Park, for U.D.C.; T. H. MacDonald, town clerk, Town Hall, Lisburn.

London.—Extension to Stepney housing estate (75 dwellings); L.C.C. architect.

Macclesfield.—Alterations and additions to Club; Secretary, Building Committee, Y.M.C.A., Derby Street.

Offices; the Secretary, Sutton Dyeworks, High Street.

Additions to premises, New Road, Butley Ward, Prestbury, for nursery school; Mrs. B. M. Lebb.

Mansfield.—Alterations to fire station for control room and new kitchen; W. Thompson borough surveyor, Carr Bank.

Matlock.—Alterations to fire station; Ben Beddington, builder, School Road.

Building for special welfare clinic, and extensions to public library; J. Turner, surveyor, Town Hall.

Middleton.—Day nurseries; J. Pollard, borough surveyor, Town Hall, Middleton, Lancs.

Newcastle-on-Tyne.—Six nurseries (£14,810); R. G. Roberts, 18, Cloth Market.

Northumberland.—Hostel at Stocksfield and wartime nurseries at Stocksfield, Alnwick and Prudhoe; county architect, County offices, Morpeth.

Nottinghamshire.—Approved school, Risley Hall (£15,000), cleansing stations (£4,000), and school canteen, workshop (£2,377); county architect.

Ordsall.—Works canteen, off Ordsall Lane; J. E. Armstrong & Co., Ltd., building contractors, Yew Street, The Cliffe, Manchester.

Ormskirk.—Extensions including new pumping plant (£6,331) for U.D.C.; J. E. Wright, engineer, Council Offices.

Redditch.—British Restaurants at Redditch, Astwood Bank and Crabb's Cross; L. O. Wilkes, surveyor, Council House.

Rowlands Gill (Co. Durham).—Canteen at Victoria Garesfield Colliery; J. J. Eltringham, Derwent Street, Blackhill, Co. Durham.

Runcorn.—Bus station; R. C. Cowmeadow, resident architect, Crosville Motor Services, Ltd., Crane Wharf, Chester.

Salford.—Huts for British Restaurants, and restoration of portion of Town Hall; W. A. Walker, borough engineer, Town Hall, Bexley Square, Salford, 3.

Sheffield.—Shop premises, Scott Road; Brightside and Carbrook Co-operative Society, Ltd., Exchange Street.

Additions; E. H. Parkin & Co., Ltd.

Shropshire.—Canteens at schools (£23,506); A. G. Chant, county architect, 5, Belmont, Shrewsbury.

Smethwick.—Restaurants, Grove Methodist Church and Regent Street Chapel; borough engineer.

Cleansing station, Rolfe Street (£2,169); W. Cooper & Sons, Ltd.

South Shields.—Shelters at St. Bede's School (£800) and repairs to public baths (£2,000); A. G. Richardson, acting borough engineer.

Extensions, biscuit factory, Wright & Co., Rutland Street; Marshall, Tweedy & Bourn, Grainger House, Blackett Street, Newcastle-on-Tyne.

Spenborough.—Public cleansing station at destructor works for U.D.C.; J. Wallbank, engineer and surveyor, Town Hall, Cleckheaton, Yorks.

Stanley (Co. Durham).—Canteen, Morrison Pit: Marshall, Tweedy & Bourn, Grainger House, Blackett Street, Newcastle-on-Tyne.

Stirlingshire.—Cleansing stations at Stirling, Falkirk and Grangemouth (£2,950); county architect, Viewforth, Stirling.

Stretford.—Restaurant, Victoria Park School (£375); J. & H. Rogerson.

Additions, Frank Rosser, Ltd.

Sunderland.—Additional shelters at Plains Farm School; education architect.

Ventnor.—Water pumping plant (£900) for U.D.C., town surveyor, St. Johns House, Albert Road.

Wallsend.—Canteens for Swan Hunter & Wigham Richardson Ltd., and R. Hood Haggie & Son, Ltd.

West Bromwich.—Central cooking depot; borough engineer.

Wolverhampton.—Community hall; Kempthorne Avenue, and extensions, Marsh Lane school; borough engineer.

Worcestershire. — School canteens; county architect.

York.—Two hostels (£2,000 each); C. J. Minter, city engineer, Guildhall.